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Biography

BRIGADIER H. S. MOSLEY, D.S.O., R.A.V.C.

Director of Veterinary Services in India.

ALL who have watched the career of H. S. Mosley, and especially those who came in close contact with him and served under him during the War, will receive with pleasure the news of his promotion to the second highest position in the Royal Army Veterinary Service, that of Director of Veterinary Services to the British Army in India, with the rank of Brigadier.

A graduate of the London College at the time of the South African War, he commenced his Army career as a civil veterinary surgeon with the troops in 1899, and in 1902 was offered a Commission in the Regular Service. Between then and the time of the Great War his time was spent partly in India and partly in England, his duties including appointments at Aldershot and the Cavalry Schools.

In August, 1914, on the outbreak of war, Major Mosley was sent to France in command of No. 1 Hospital, subsequently becoming A.D.V.S. of the Fourteenth Army Corps, and ultimately, upon transference to Italy, A.D.V.S. at General Headquarters. His war services earned him a brevet lieutenant-colonelcy, two mentions in despatches, and the decorations of D.S.O. and the Crown of Italy. On returning to England, Lieut.-Colonel Mosley was appointed Chief Instructor at the R.A.V.C. School at Aldershot. This post he held until proceeding to India for another term of foreign service in 1923. Here he occupied several important posts, and upon returning to England in 1928, he was appointed Commandant of the R.A.V.C. School at Aldershot, and also of the Army School of Farriery. It was from there, in 1929, as Colonel and D.D.V.S. of the Aldershot Command, that the promotion to Brigadier and Director of Veterinary Services in India was made; and, as stated above, the many friends of Brigadier Mosley who know his genial kindliness and tireless energy, and who have watched his career from student days, will unanimously agree that the right man has been put in the right place.

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Editorial

THE CONTROL OF FOOT-AND-MOUTH DISEASE.

DURING recent months sporadic outbreaks of foot-and-mouth disease have occurred in different parts of England and Wales. Infection in the various centres was satisfactorily eradicated without any extension of disease beyond the limits of the premises first involved in the majority of cases. The announcement by the Ministry of Agriculture and Fisheries, on January 11th, of the imposition of restrictions over a large area in the Midlands, Eastern Counties, and South of England, indicated that a grave situation had arisen. Late on the night of January 9th, and on the following morning, disease was found to exist at Leicester, Birmingham, Nuneaton, and Derby. The information obtained by the Ministry's inspectors pointed to the possibility that infection had not arisen at any of these places, but had probably been introduced by the movement of animals from elsewhere. Several lines of movement were investigated, and by the evening of January 11th suspicion attached to animals despatched from Reading.

Acting on the information then available, the Ministry decided to prohibit free movement of animals over a wide area in order to prevent the exposure of dangerous animals in markets for store stock. Abundant justification for the action taken by the Ministry began to emerge on the following day, and at the time of writing fifteen outbreaks widely distributed in the southern counties have occurred among animals recently purchased at Reading. There is little doubt that the action taken by the Ministry on January 11th has prevented the development of a disastrous situation, for if a delay of only a day or two had taken place it is highly probable that other markets would have become involved, causing increased interference with the livestock industry, and a greater call upon public funds for compensation for the destruction of diseased stock. A widely scattered series of outbreaks like the present one imposes a severe strain upon the Veterinary Department, reinforced by members of the profession, who are always willing to aid in an emergency, and it is hoped that their efforts will soon be rewarded by the complete eradication of the disease.

The Ministry is to be congratulated upon the prompt action taken to arrest movement of stock—the most potent factor in the dissemination of this highly contagious disease. In a situation such as that with which the Ministry was confronted it is imperative, at the earliest moment, to take action over a wide area in order to get ahead of disease ; for in some circumstances the disease cannot be overtaken by the onerous method of tracing animals which have been exposed to infection. Fortunately the precautionary measures imposed do not interfere with hunting.

Uninformed opinion is apt to believe that the policy of eradication by slaughter is peculiar to this country, but such is by no means the case. In Europe, the Irish Free State, the Government of Northern Ireland, Norway, Sweden, and in recent times Switzerland, have adopted the policy. In the United States the same policy is in force. Obviously the geographical situation of a country and the sanitary state of its neighbours determine the policy, the alternative

being isolation of infected flocks and herds, with the natural corollary of endemic disease.

The British public, the taxpayer in particular, does not adequately recognise the great work which is being done so satisfactorily and continuously by the Veterinary Department of the Ministry of Agriculture, and the hundreds of thousands of pounds which their advice and good management saves to the country on this disease alone. The daily press, too, is not always as helpful as it might be, in that the tendency seems sometimes to be to write up the subject under alarming and exaggerated headings, the writer of the article frequently displaying the most appalling ignorance, not only of the disease in question (which is perhaps under-

standable), but of all diseases of farm stock. That the present " stamping out " policy is the best possible is well illustrated by the undermentioned table showing a comparison of the numbers of outbreaks in Great Britain and some of the other countries of Europe.

Month	Great Britain	France	Germany	Holland	Belgium
January	1	552	3,224	298	50
February	—	511	2,828	341	57
March	—	368	2,107	269	72
April	2	111	988	129	65
May...	—	77	1,266	216	33
June	—	156	1,183	441	120
July	—	812	1,838	747	738
August	3	1,681	2,144	1,481	439
September	4	1,728	1,610	3,129	1,067
October	2	1,206	978	2,656	256
November	4	1,125	448	879	97
December	8	*	*	*	*

*Figures not yet available.

Our insular position gives us many advantages over foreign countries with land frontiers, and this is even more obvious in the fight against contagious diseases of animals than it is in that against the diseases of man. Especially when one takes under consideration the question of transportation and transmission either by other animals of the same kind, or by those of other and smaller species ; and once eradicated from Great Britain, except for transmission by other sources than the arrival carrier, it is almost impossible for any disease of animals to again gain a footing into the country. The disappearance of glanders and epizöotic lymphangitis of horses, contagious pleuro-pneumonia and rinderpest of cattle, and rabies of dogs, are amongst those to which the veterinary profession in Great Britain can point with pride as instances of the result of the maintenance of a well-organised Veterinary Department as an adjunct to the Ministry of Agriculture ; and the way in which the present outbreaks, alarming as they have seemed to be, have been controlled and eventually stamped out, bears excellent testimony to the watchfulness and efficiency of the policy carried out under the direction of the Chief Veterinary Officer, Mr. Kelland, and his colleagues at Whitehall.

PASTEURISATION OF MILK.

THE proposal by the Manchester City Council that that authority be granted power by Parliament to require compulsory pasteurisation of milk (except Certified and Grade A Tuberculin Tested) sold within the limits of the City, has been rejected by the citizens of Manchester on *referendum*. With the motive of the citizens for rejecting the proposal we are not concerned, and whilst the profession generally are anxious that the human population of the British Isles shall incur the minimum risk of contracting bovine tuberculosis by the consump-

tion of infected milk, a risk which would not have been entirely eliminated by compulsory pasteurisation, we should take stock of the position which arises out of the result of this declaration of popular opinion, if it can be assumed that the opinion of Manchester, as we have so often been told in other matters, indicates on this the opinion of the rest of the country.

It may be observed that compulsory pasteurisation, had powers been secured by the Manchester City authorities and extended to other parts of the country, would have produced a deplorable state of affairs in so far as the health of the herds in this country is concerned. The most powerful incentive for producing a milk of high sanitary standard would have been eliminated since the authorities would have tolerated an inferior product made " safe " by a simple process. The standardisation of milk under such conditions would have arrested the progress which has been made in recent years by the farmers in an endeavour to improve the quality of milk. The need for inspection of animals, and of the Tuberculosis Order itself, would, under compulsory pasteurisation, be questionable.

A desire on the part of the community to be able to obtain raw milk imposes greater obligations upon the authorities, the dairy industry, and the profession. The need for more extended inspection of dairy cows should be an understood alternative to compulsory pasteurisation of milk. The responsibility of the owner promptly to report cases under the Tuberculosis Order is also implied. It is obvious from the Report of the Standing Committee of the Council of Agriculture for England, which has appeared in the lay press, that the Committee is fully aware of the seriousness of the position, and has recommended that the State, by central organisation, should undertake the duties of inspection of dairy cows. At the present time, with so few counties in England actively undertaking this optional work, the opinion of the Standing Committee may appear startling to some ; but it would seem that the Committee was looking to the future in making this recommendation. It will be admitted that the present state of bovine tuberculosis in the country is unsatisfactory. It will also be conceded that sooner or later the Government will be compelled to initiate schemes of eradication, and will be expected to contribute financially to the cost, which is bound to be heavy if any progress is to be made. In the United States and in Canada, where the eradication of tuberculosis has achieved remarkable progress, the central authorities have taken the dominant part in the campaigns, and there is little doubt that without the participation of the central authorities the achievement would have been on a very much smaller scale.

Attempts at eradication by a multitude of local authorities would lack uniformity, a most important point in a problem of this kind. From the administrative point of view, particularly over the control of areas, it seems essential that the central authority should govern the conditions under which animals should be admitted, and it is obvious that, if we may envisage the situation when a number of areas will have been established in different parts of the country, only if they have been established on a uniform basis can interchange of animals

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take place between them. There should be a uniform method of eradication and liberty of movement between areas of similar status, for unnecessary prohibitions would cause hardship, whilst, on the other hand, any laxity would defeat the object attained at great cost and inconvenience, or defer its achievement. On grounds of economy, too, separate staffs employed by individual local authorities could not be defended, and in connection with the exportation of pedigree stock the tendency of Governments to-day is to look to the central authorities, and to no other bodies, for guarantees which they may require. We think that the Report of the Standing Committee deserves the careful attention of the profession, as the authors have evidently carefully considered the situation, not merely as it exists to-day, but as it may develop in the future; and we might add that we hope that the future situation to which they look forward may not be long deferred.

RESEARCH INTO SHEEP DISEASES.

In this number of The Veterinary Journal appears an article on "Cripples in Lambs," by W. Lyle Stewart, M.R.C.V.S., from the Armstrong College, Newcastle-upon-Tyne. This article indicates the type of work that is being undertaken under the Alan, Duke of Northumberland Memorial Bequest. The interest taken in agriculture, and more particularly in research into animal diseases, by the late Duke of Northumberland is well known, and no more fitting memorial to his memory could have been set up than the "Alan, Duke of Northumberland Memorial Bequest," representing a sum of money collected among the agriculturists whose interest he had so much at heart. A Memorial Committee, under the Chairmanship of the Right Hon. Earl Grey of Howick, has decided that the interests of the fund should be devoted to research in sheep husbandry, precedence being given to the investigation of sheep and lamb diseases. Although research into sheep diseases has progressed in late years, there is still a wide field for the research worker, and the decision of the Memorial Committee to devote their available funds to such investigations as that recorded in this number of The Veterinary Journal will meet with general approval among the veterinary profession and agriculturists alike. We look forward to further articles representing work performed under the Bequest.

General Articles

THE BOVINE TUBERCULOSIS PROBLEM AND A SIX-YEAR PLAN OF ERADICATION.

By WM. S. STEVENS, M.R.C.V.S.

In putting forward this plan, including a general survey of conditions surrounding the problem of bovine tuberculosis, I do so fully aware not only of the interest that has been taken in this subject recently, both from the human and animal point of view, but also that other plans have been either suggested here or put into action in other countries. Before outlining the plan I have in mind, it will be of advantage to examine the different aspects of the problem with which it is designed to deal. In the first place it will make for clarity if I reduce to two reasons why elimination of bovine tuberculosis is desirable. These are: (1) the humane; (2) the financial.

(1) The humane reasons are: the prevention of unnecessary suffering in the human being, due to infection with the bovine type of tuberculosis; and in a similar but different degree, prevention of the sufferings of affected cattle from the same cause. Readers of recently published literature on infantile tuberculosis of bovine origin will no doubt be familiar with the findings of research workers on this aspect of the tuberculosis problem. To recapitulate roughly, I will quote the following from a recent report by a special committee appointed by the People's League of Health: "The maximum incidence of tuberculosis of bovine origin is in childhood. About 2,000 deaths in England and Wales, mostly in children, occur annually from this cause. At least 4,000 fresh cases of bovine infection develop each year, an immense amount of suffering and often permanent deformity being caused by this bacillus." In order to eliminate this infantile infection, the milk on which children must rely when breast feeding ceases should be either from tubercle-free herds of cattle or from very carefully pasteurised milk. At the present time it is a practical impossibility to furnish the whole of our milk in either form, but there is an alternative, namely, that *that portion of the milk required for children be separated from the main milk supply.* Assuming that this portion for the children is so separated, we then have to consider our choice, namely, is it to be a milk derived from cattle which are free from tuberculosis, or a supply from an uncertain source, pasteurised for safety? Pasteurisation of milk is heating it to a point above 145° F., but below 150° F., and holding it there for half-an-hour.

The objections to pasteurisation are many: firstly, that it encourages the supply of a milk of doubtful quality, as producers and handlers are inclined to take the view that "it does not matter, so long as it is to be pasteurised." Another objection is that pasteurisation is a delicate operation, and that it is not really

feasible in commercial practice to pasteurise milk in the short time available in the so-called milk factories, since the milk is inevitably either partly underheated or partly overheated. Further, the term pasteurisation is frequently used as a cloak to heat milks of doubtful keeping qualities, to no definite temperature, in order to prevent souring; and this milk is perhaps reheated, not only once, but often a number of times before it reaches the public—an objectionable practice, as it destroys its food value and palatability. Milk, once it is heated, appears to lose its inherent quality of keeping fresh; it then sours more quickly than unheated milk, and after heating it is more readily contaminated. I was credibly informed by a member of the medical profession resident in the area which experienced the notorious and comparatively recent outbreak of septicæmia, and where milk was indicated as the vehicle of distribution of the infection, that this milk was sold under the denomination of " pasteurised," and it is much to be regretted that an insidious campaign in favour of pasteurisation is being carried on amongst the public and medical men. A further objection to a heating process for milk should be emphasised, namely, that it destroys certain attributes of milk which go to the making of a sound body, especially sound teeth. The details of the changes are rather intricate, and subject to some controversy, but the great difference in calves reared on pasteurised and unpasteurised milk respectively affords a striking example. Furthermore, pasteurised milk is distinctly less palatable than fresh milk when drunk by itself.

I think I have said sufficient about the objections to pasteurisation; but " the man in the street " naturally puts the same more crudely: he says: " Why should I have to boil, or have boiled for me, my daily milk supply? I am not told to boil my water; surely it is important that I should not have to boil my milk. Why not produce it clean and uncontaminated instead of boiling it afterwards? "

The financial reasons for the elimination of bovine tuberculosis are again divisible into two main considerations, namely, (*i*) the desirability of assuring a cessation of the expenditure at present necessary to preserve human health, and even life itself, from the ravages of the bovine type tubercle bacillus; and (*ii*) the prevention of the extensive losses from this cause incurred by those engaged in agriculture. It will not be necessary to enlarge much on the financial side as it affects human beings, for it will easily be recognised that the cost of nursing sick children either at home or at institutions, and other incidentals, are definite losses; the economic aspect of the question as it affects the agricultural community, however, requires more detailed consideration. Bovine tuberculosis is a disease which comes under the vague description of " insidious "—a word difficult to define; but probably most people have a good notion of what the word suggests. As applied here, I think it would be fairly accurate to say that very many animals are the harbourers of tuberculosis lesions without any apparent clinical manifestations, and appear to the eye quite healthy. It is because of this fact that the farming community and others are slow to estimate the damage which is being done by this disease, and the loss which they in consequence have to face.

Such a disease as foot-and-mouth is in this country a spectacular affection, the occasional losses are apparently obvious and large, and they secure an abundance of press notices and publicity. At any rate, a fairly definite monetary assessment can be made of them. On the other hand, losses due to bovine tuberculosis, although many times larger and continuous, are in a way hidden, and therefore not so well appreciated. It is, nevertheless, quite clear by ascertainable facts that farmers and others would benefit very materially by a complete extermination of bovine tuberculosis in this country. Hitherto, however, they have hesitated to face any loss that might have to be borne to reach this goal. We may now approach more nearly the question of eradication, having defined the many problems and points of view that must be considered before attempting to prepare a suitable plan of campaign, with due regard to any complications.

The goal to be aimed at is the gradual destruction of *all* cattle affected by tuberculosis, whether only slightly or seriously. Two courses are possible, firstly, the direct ; and, secondly, the economic (indirect).

The Direct Method.—By this I mean a method where neither financial nor sociological considerations would be allowed to impede the rapid carrying out of the end in view, namely, testing and slaughtering all cattle which react to the tuberculin test. Under these conditions no one has, I think, doubted that bovine tuberculosis could be quickly eliminated—however, at such a large cost and economic inconvenience, disturbance of the milk supply and interference with farming routine, as to place this method, at any rate at the present moment, beyond the purview of even the extremists.

The Economic Method.—Under this heading comes the six-year plan, which I am putting forward in more detail later ; but before doing so, a cursory glance at the present methods of eradication which are now in use will be of value. In the United Kingdom these methods consist of infrequent and poorly organised partial clinical examinations of milch cattle, which with few exceptions are made under difficult conditions annually, and then only in some localities, and, further, only badly infected animals are allowed to be condemned. There is also a scrappy, unorganised examination of the milk for tubercle bacilli, usually in the large towns. In addition, but so small as to be almost negligible, there is a voluntary production of so-called graded milks. The present plan of clinical examination, although distinctly helpful, is so slow as to be almost disheartening.

Tuberculin testing under the Milk Designations Order is a very involved affair ; and the designations of the different grades of milk would, if the matter were not so serious, be almost laughable—Grade A being the *least* desirable. The Ministry of Health and the Board of Agriculture between them, whether knowingly or unknowingly—let us hope the latter—combine to frighten away farmers by their bureaucratic methods ; in addition, the farmer himself is made to pay all the Government as well as his own out-of-pocket expenses if he takes up the production of tubercle-free milk. Under the suggested six-year plan, although economy would be carefully followed, some money must be found, and I suggest that a

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national sweepstake fund would be a reasonable method for raising money for the extermination of bovine tuberculosis by the six-year plan, because the plan would definitely relieve the hospitals of some of their patients through freeing children from diseases of the bovine type of tuberculosis, and would also, by the provision of a generous pure milk diet, be the means of allowing healthy children to grow up, in the general sense of the word, particularly in the case of town dwellers. Moreover, in a few years, the necessity for such a measure should automatically cease.

The Six-Year Plan.

In presenting the six-year plan, I have particularly taken into consideration the following: (*a*) Importance of unpasteurised, tubercle-free and sound milk for children (a credit factor); (*b*) economic debtor factors; (*c*) the time factor; (*d*) the aim of complete extermination (a credit factor).

(*a*) A full supply of milk from tubercle-free cattle for children must be a generally recognised ideal for many reasons, which include those enumerated under the economic factors. Every child up to five years old (later up to eight years old) would be entitled to a pint (later on a quart) of the T.T. milk daily, at ordinary milk prices. Distribution would be made through the elementary schools; children too young to attend would be supplied by means of a messenger sent by a parent or a guardian, suitable means of identification being adopted. The milk would be delivered in bulk to the schools, and consumed on the premises, and thus a considerable saving in distribution costs would be made, and allow for a margin to counterbalance the slightly higher wholesale price to farmers. Any child whose parents were (as certified by appointed persons) too poor to pay for this milk would be supplied with it free of charge, and I contemplate sufficient money being saved for this contingency.[1]

(*b*) Economic debtor considerations divide themselves under two heads, namely, (1) the cost of a supply of tubercle-free non-pasteurised milk for children only, and (2) the cost of complete elimination. The first would only operate during the elimination period. The smaller portion of milk required for child consumption being isolated from the bulk, and a suitable economic scheme for distribution (a very important point) organised, there should then be no reason why tuberculin-tested milk could not be available to all children in a very short space of time (with the additional aid of the heifer elimination plan)[2] at the same retail price as ordinary milk, although the farmers would be receiving a higher wholesale price for this same (specialised) milk. By this means the difficulty of the children's pure milk supply would be overcome immediately, without waiting for the more lengthy process of the total eradication of tuberculosis from our herds. For a short time possibly a small portion of the children's milk may have to be very carefully pasteurised in some districts.

(*c*) *The Time Factor.*—Elimination of tuberculosis at the present rate of progress is very slow, and this condition intensifies the urgency of the plan for the children's T.T. milk supply being dealt with with as little delay as possible.

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Owing to the more intensive stocking of pastures in recent years, made possible by means of feeding on concentrated foodstuffs in the form of cakes, meal, etc., the dressing of pastures with artificial manures, made available and increasingly used by farmers, also the harrowing-in of natural cattle manures, contamination of pastures has been remarkably accelerated. Incidentally, due importance has not been attached to the part these practices play in the dissemination of bovine tuberculosis; and I, personally, regard this as one of the most serious problems we have to deal with in counteracting the spread not only of bovine tuberculosis, but also of other bovine diseases. In fact I maintain that this increasing incidence of cattle re-contamination through the pastures almost balances the elimination of animals slaughtered under the Tuberculosis Order. The method of conveying dung (which must be contaminated) to pastures, and harrowing it in, prevents cows from voluntarily avoiding their own droppings, as they will naturally do when ordinary grazing is carried out, and the cow-dung only applied to arable land. It is therefore essential that an intensive campaign against *B. tuberculosis* by complete extermination of infected bovines be conducted, and this leads us to that side of the scheme which aims at this goal.

(*d*) *Complete Extermination.*—Most people have heard of the Russian five-year plan. It has the advantage of placing before those interested a definite goal, and one which can be visualised by all; furthermore, it has the psychological advantage of appealing to man to do things in unison, and in organised formations It moves our latent animal herd instinct to follow a leader, but is the antithesi. of individual effort, and simulates the leading of a herd of cattle, or birds in formation flight. Civilised man, however, should and can visualise the substitute, *i.e.*, a programme of work to be completed at a given date.

(*a*) The Area of Attack.

We are in this instance particularly fortunate in the geographical formation of the British Isles, in that there exist here not only a few islands, but also definite areas of the main island separated by inlets of the sea, and also a comparatively large number of separate river formations.

On the following page is a map with suggested conveniently marked areas of the British Isles which are desirable for the campaign of the six-year plan. The complete plan will occupy, as mentioned, six years in all, but each area undergoes three periods of control of two years each. Certain parts on the map are marked with horizontal lines, and are to be taken as a first two-years' period area, which I call the first area of the six-year plan. It will be noticed that those parts which are not actual island areas are almost isolated from the mainland by sea or river, and could be segregated, as far as the cattle population are concerned, with no great trouble.

There are the outer islands, such as the Isle of Wight and the Isle of Man, which do not present any difficulty at all as to definition. There are also definite projections or peninsula-like formations with only small land boundaries to guard,

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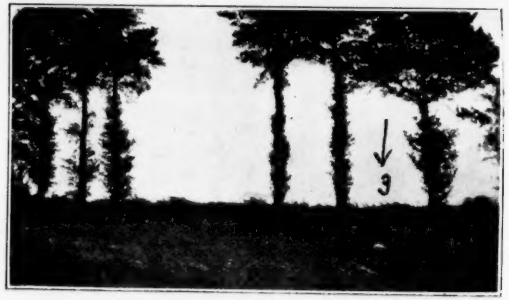
best exemplified in the area comprising Cornwall, Devonshire, Somerset, and Dorset. Such areas will be the first to be dealt with; and next the successive additional areas marked with dots, and ultimately the unmarked areas, until the whole of Great Britain, with the exception of the Irish Free State, is

covered. Ireland presents a problem of its own, but I have taken Ulster as one of the first areas to be attacked.

(*b*) The Method of Attack of the Six-Year Plan.

During the first two years an intensive clinical macroscopic examination of the cattle, also an intensive microscopic examination of milk samples. These are to be taken not only in the towns, but also at the farms, at the wholesale depots, and at the milk shops. This examination would form the

No. 1.



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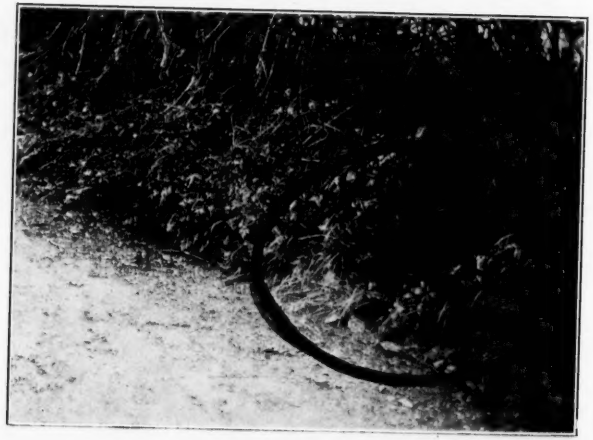

No. 4.

(Article by J. W. Hall Masheter, M.R.C.V.S., *page* 61)

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main basis of attack, and would be combined with a general medical supervision of the personnel handling the milk, including their families, by the medical officers of health, together with regulations for the disposal of cow dung, when possible, on arable land, reasonable attention to cleanliness, water supply, sanitation, and construction of cow houses. Provision would also have to be made for the keeping by farmers and dealers of a careful record of purchases, sales, deaths, and other disposals or acquisitions of cattle in special animal record books.

The second two years of the six-year plan would be a period of tuberculin testing of the cows remaining from the first two years' eliminations, and the disposal of reactors either by slaughter or segregation under suitable conditions on isolated farms. The milk from the segregated cows will be disposed of under special regluations. During this second year period a further area would come under the regulations of the first two years, and the first area would ultimately come under the last of the two-year periods (completing the six years). During the last two years any milk in the area would be prohibited for human use unless produced from cows which had passed the tuberculin test. This would complete the period of the six-year plan as far as the first area was concerned.

The areas have been chosen so that they may be as self-contained as possible, and any traffic of bovine animals to and from the areas would naturally have to be controlled. I suggest that although the expense of the six-year plan must be mainly borne by a general fund, the cost of tuberculin testing alone during the last two years should be borne by the owners of the cattle themselves.

REFERENCES.

[1] However, failing this, we could, as already suggested, establish the legality of sweepstakes in England, from which source money should first be devoted to this cause, as it is in effect a saving of hospital costs by elimination of a portion of the patients.

[2] The heifer-elimination plan I have outlined in another paper. It consists of building up the tubercle-free herds by buying heifers in the open market at commercial prices, testing them, and then eliminating the reactors—which latter are as a rule suffering only from the slightest lesions—and fattening them for slaughter. By this method tubercle-free herds can he built up at a low cost.

LIGHTNING STROKE.*

By J. W. HALL MASHETER, M.R.C.V.S.
Newnham-on-Severn.

PHOTOGRAPHS Nos. 1 and 2 give a panoramic view of the area affected. These show the posts to which one strand of barbed wire is attached, and the position: (1) two ewes and three lambs, (2) two lambs, (3) one lamb, of the animals killed. Nos: 1 and 2 are in a straight line, and the lamb 3 is under the fence at right angles, and this lamb is lying *on* the wire, which at this place was lying on the grass. The two lambs (2) had been moved from the fence by some children,

* Since writing the above (it was written in June) W. S. Stevens, M.R.C.V.S., has an interesting article in the *Veterinary Record* (October 22nd, 1932) which answers my question "Have these pylons attractive power during a thunderstorm?" to some extent, although his article was on "Electric leakages," but it does bear on the subject in an illuminating fashion.

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their original position being under the wire and close to the wooden post which is splintered near its base.

Photograph No. 3 shows where the ground had been struck by lightning, and the fence scorched. This photo clearly shows the barbed wire and the posts to which it was attached. The first post was stripped of bark, and shows up quite clearly, whilst white splintered parts can be seen on almost all the posts going to the right, and if one turns again to photo. No. 1, it will be seen that the posts and wire carry on to the left of the place where the ground was torn up to the gateway. Most of these posts also showed splintering.

Photograph No. 4 shows the hole blown out of the bank on the distal side of the fence, and the shrivelled foliage and fence opposite to the place shown in photograph No. 3.

Photograph No. 5 shows the position of the two ewes and three lambs lying under the fence and beneath the wire. Note pylon in the background.

Photograph No. 6 shows the two lambs which had been moved by the children down the bank away from the wire under which they had been killed.

Photograph No. 7 shows the right-angled turn of the fence and wire, and the position of the lamb lying *on* the wire, which at this place had dropped from its support on the right.

Photograph No. 8 shows a pylon erected by the Electricity Commissioners, and this, taken in conjunction with photograph No. 5, showing another pylon and the position of the ewes and lambs, makes one ask the question : Have these two pylons attractive power during a thunder storm ? If so, in view of the network of pylons being erected all over the country in connection with electrical supply, is it possible that the risk of lightning stroke is going to be more frequent in the future ? It may be, however, that the electric fluid will be earthed at each pylon, or carried by the cables (if they are not insulated) and earthed at intervals of several pylons. If they are earthed as above, is it possible for the fluid to emerge at a distance, meet another conductor, and cause damage ? These pylons are about 300 yards apart. They had no cables attached, having just been erected.

One cannot account for the vagaries of lightning, but one can make a guess as to the course of the lightning in this case. The direction of the wind was from the place where the lightning struck the ground in photograph No. 3 to pylon No. 1, *i.e.*, in the direct opposite direction, if one is correct in assuming that the force of explosion was greatest in the lane where the hole was blown in the bank, as seen in photograph No. 4, so that pylon No. 2 was nearest to the sheep and lambs killed. That is pure assumption ; but when we come to the wire, one is more or less certain that the barbed wire carried the electric fluid both to right and left of the place where the ground was torn. On the left it seems to have earthed at the gate post, whilst on the right it seems to have carried on right round the field until it came to where the solitary lamb was (Photographs Nos. 2 and 7) and earthed there. The length of wire affected was about 400 yards.

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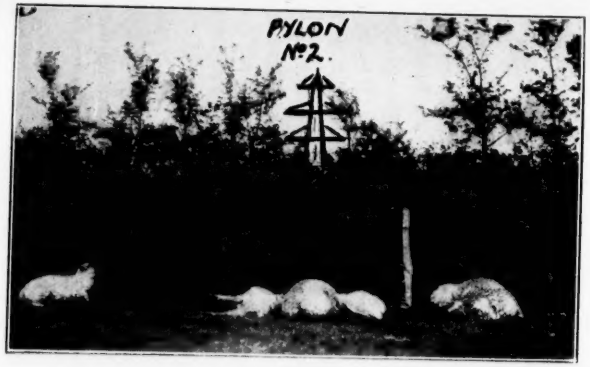

No. 5.

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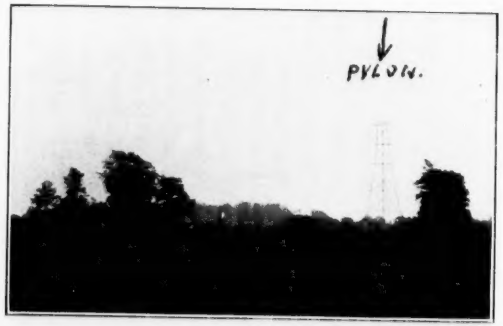

No. 8.

(Article by J. W. Hall Masheter, M.R.C.V.S., *page* 61)

"CRIPPLES" IN LAMBS.

By W. LYLE STEWART, M.R.C.V.S.
Armstrong College, Newcastle-upon-Tyne.

Introduction and General.

DURING the spring of 1929 the writer's attention was directed to a curious disease occurring among young lambs bred on certain farms in the North of England. This disease—termed somewhat loosely "cripples," "stiffness," and also "rickets"—affected moderately well-nourished lambs from the age of seven to fourteen days, and was characterised by stiffness of gait and by an abnormal fragility of long bones and ribs, which resulted in their frequent fracture arising from comparatively trivial causes. The general attitude of affected animals suggested the presence of pyæmic infection, but the eyes were bright, and joints neither tender nor swollen, while on post-mortem examination there was an entire absence of sepsis in the umbilical region, liver and joints. All the affected cases examined failed to reveal any abnormality other than in the long bones and ribs, which showed what was apparently a condition or state of imperfect osteogenesis. In several cases the ribs were extremely brittle, and snapped across like dry twigs on the slightest manipulation, while in others the shafts of the long bones were completely torn away from their epiphyseal junctions.

The trouble was not considered entirely new, since all shepherds are acquainted with varying degrees of "leg weakness" in lambs, attributed to exposure, feeding with cow's milk, joint trouble, swingback (ataxia) etc., but the occurrence of large numbers of crippled lambs from no very obvious cause was regarded as unusual and alarming. Generally speaking, flockmasters were inclined to consider that the stiffness was non-specific in nature, and connected or aggravated by the backward nature of the seasons. Nothing further was done that year, but on the basis of local opinion, and on general grounds, it was recommended that crippled lambs be treated with cod-liver oil daily, and in some cases this appeared to be followed by amelioration of the condition.

Later inquiries showed that the occurrence of the disease was by no means accidental, and that in all probability "cripples" has a fairly wide distribution over the pastoral districts of the northern province. On several farms the number of stiff or crippled lambs approached one-half of the total number of lambs born, and it was noted that similar systems of sheep management prevailed on all these farms. All are grassland holdings, *i.e.*, permanent pasture farms with no plough land, situated geographically midway between the uplands or higher grazings and the lowlands. These farms comprise poor to moderate lands where the herbage has been improved and the stock-carrying capacity increased by application of the principles of modern grassland management. Food is plentiful in late summer and autumn, and hill-bred Blackface and Cheviot ewes are purchased to replace that proportion of the ewe stock which is annually fattened off. The change of pasture reacts favourably on the ewes, which by

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November are in flushed condition when mated with the Border Leicester ram in order to produce cross-bred lambs for the butcher. A large proportion of these ewes produce twin lambs, each larger than the single pure-bred lamb which constituted their normal yield prior to drafting, and the question arises whether there is a compensating improvement in the quantity and quality of the food throughout the winter months. Or, stated another way: is there any evidence that pastures, adequate as they may be in autumn, provide insufficient total calories or inadequate protein, and/or too little mineral matter for optimum physiological needs during the four rather barren months from January onwards?

In normal years it is not customary to supply any artificial or concentrated foods or even hay to these ewes; they are grass-fed entirely throughout the period of gestation. Many farmers admit that the flocks would probably benefit from a ration of oats or concentrates, especially in early spring, but this is generally withheld on the score of expense. So far as one can tell by casual examination, the condition of the ewes as lambing time approaches appears to be satisfactory. The ewes have certainly lost flesh, and possibly also weight, but are free from the usual and visible signs of malnutrition.

The Clinical Condition.

Farm Histories.—Farm No. I.—Consists of poor to moderate grassland bordering heath. The pastures have been improved during the past fifteen years by the application of nitrogenous and phosphatic manures, with a consequent increase in the stock-carrying capacity of the farm by about 20 per cent. This farm carries a Blackface breeding stock of 300 ewes, which are crossed with the Border Leicester ram to produce early maturing lambs. Each autumn a fresh draft of ewes is purchased from higher grazings to replace that proportion of the stock from which it is no longer desired to breed. These ewes benefit from the change of pasture, and are in bloom condition at mating time, and it is believed that flushing the sheep in this way results in a larger percentage of lambs. About 60 per cent. of the ewes produce twin lambs in April, and the remainder singles. At no season of the year are these ewes given artificial food or hay, being entirely grass-fed, and dependent upon the quantity and quality of the pasture available. In spring the ewes are noticeably thinner than in autumn, but the owner, nevertheless, considers their condition compatible with health.

In 1929, ten clinical cases of "cripples" occurred, lambs between the ages of seven and fourteen days being affected. Fractures were common in various bones, and it was observed that any sudden movement, such as caused by fright, might result in broken bones. One lamb showed healing fractures on the lower thirds of about a dozen ribs, as well as four broken long bones, all of which occurred ante-mortem. The trouble showed itself in the following years, twins and single lambs being affected in very much the same proportion.

Farm No. II.—The disease has been recognised on this farm for three years, and its incidence is extending. The land is poor to moderate, and divided into

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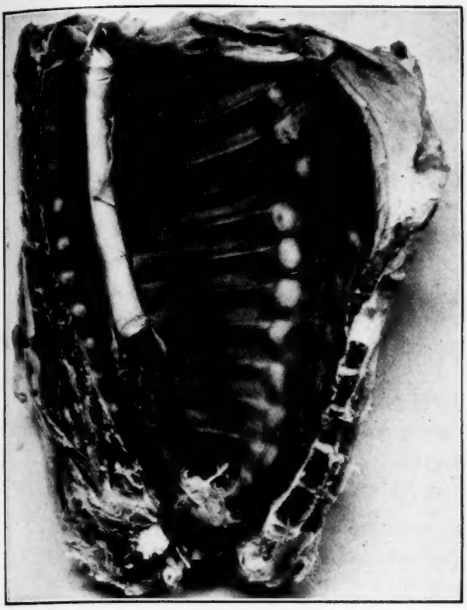

FIG. 1.—Thoracic wall of "crippled" lamb, showing series of healing fractures on lower aspect of ribs. There is abundant formation of callus.

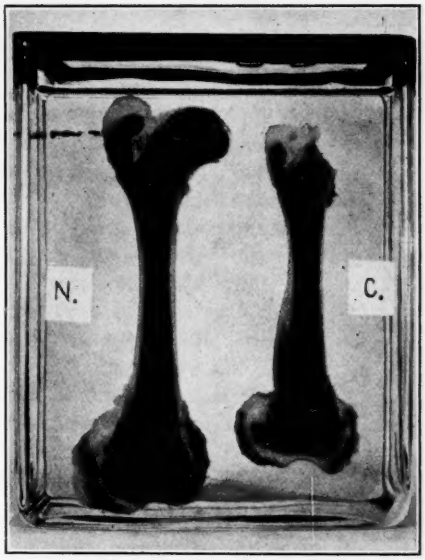

FIG. 2.—Femur of normal and "crippled" lambs, showing buttressing of right-hand bone by adventitious calcareous tissue. The head of this bone has been torn away near its epiphyseal junction.

FIG. 3.—Radius and ulna from normal and "crippled" lambs, showing buttressing of right-hand bone.

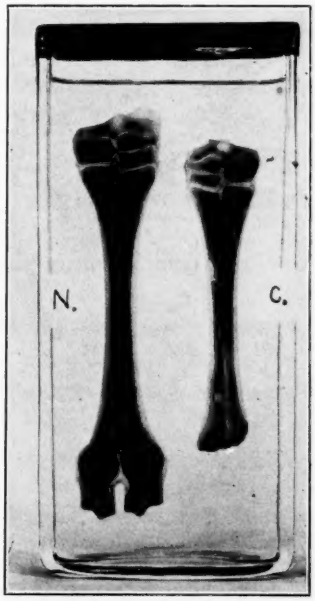

FIG. 4.—Large metacarpal bones from normal and "crippled" lambs. The distal end of right-hand bone is chipped away above its epiphyseal junction.

(Article by Lyle Stewart, M.R.C.V.S., *page* 63)

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hill and lower lying fields. Young ages of Cheviot sheep run on the hill portion, and " cripples " is unknown among their progeny. The lower part comprises a wide range of old pastures, much of which grows on poor, wet land ; but here also part of the grass has been improved by suitable manuring, and this range carries about 500 older Cheviot ewes. With the exception of a proportion of the oldest ewes, which receive a ration of oats and mineral supplements from January onwards, no artificial food or even hay is fed throughout the winter. The sheep stock is of good quality, and over 33 per cent. produce twin lambs by the Border Leicester tup. About sixty lambs were affected with " cripples " in 1929, of which the majority were twin lambs six to fourteen days old. Approximately half this number recovered, while others which had taken the ground died from intercurrent disease, or were destroyed to avoid spoiling the dams. In general, the ewes do not appear to lack milk, and the dams of affected lambs which are not suckling often show a hefted appearance of the udder.

Farm No. III.—This farm carries a stock of 400 Cheviot ewes over moderate land. The number has been increased of recent years, due to the improvement of the pastures resulting from more intensive grassland management. The ewes are mated with the Leicester ram, and the bigger proportion yield twin lambs. Cases of " stiffness " or " leg weakness " have been noted for years, and as many as two-thirds of the total lamb crop have been affected to a greater or lesser extent. Joint-ill (pyosepticæmia neonatorum) was suspected. The noticeable feature here is stiffness, leading to stilted gait or inability to walk, and many broken bones have been encountered. Feeding and management are on lines similar to that on the other two farms. The majority of the lambs recover completely, but a number remain stunted or with a shortened or deformed limb, while some crippled lambs are destroyed after lying on the ground for weeks.

Summary.

(1) The farms where " cripples " has been specially noted are similar in type and pasture.

(2) The systems of feeding and general management on these farms have been noted to be almost identical in each case.

(3) No artificial food or even hay is fed to the ewes during pregnancy. The ewes are entirely grass-fed.

(4) While cases have been noted in single lambs, the disease is commoner in one or both of twin lambs.

Another observation is worthy of mention. As previously stated, all these grass farms have been partially improved by the use of phosphatic and nitrogenous manures, but it seems certain that this improvement, commenced fifteen to twenty years ago, is scarcely being maintained, since there is a general tendency among agriculturists to balance lean times by reliance upon improvements wrought during the more prosperous years.

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Symptoms.—At first affected lambs show only slight difficulty in rising, and lag behind the dam. The following day such a lamb may be noticeably stiff. The gait is slow and jerky, the head depressed, and the limb joints are not flexed, so that the feet are scarcely lifted from the ground. There is no ataxia. This state progresses, and crippled lambs may become unable to rise, and are found apart from their dams. The general appearance of crippled lambs is bright and healthy, and body condition may be maintained if they are regularly suckled. When food is scarce, however, the ewe often wanders off with the healthy lamb, disregarding the cripple which is then fed on cow's milk. The stiffness affects both fore and hind limbs, but manual examination fails to discover evidence of inflammation. There is no tenderness or swelling over the bones or joints, no hyperæsthesia, nor anæsthesia of the skin, and an entire absence of rigid contraction of muscle groups such as described in the so-called " stiff lamb " disease of Metzger and Hagan.[1] Muscle atrophy from disease is seen in lambs which have lain on the ground for days. A striking feature in typical cases is the presence of broken bones. This may be unsuspected until lambs unable to rise are found to be suffering from one or more broken long bones. Palpation along the length of the ribs frequently reveals nodes indicating healing fractures which may be numerous. Accidental pressure on a rib may cause its spontaneous fracture, a fact which emphasises the brittle nature of the bony structures. Broken bones have not been encountered on all affected farms, but in the opinion of the writer the liability is always present. Lambs between the ages of six days and two months have been recognised affected with " cripples," but the most susceptible period would appear to be from one to two weeks. In uncomplicated cases prognosis is good, and since the symptoms are of a milk nature involving no systemic disturbance, recovery partial or complete, usually occurs in the course of a few weeks. On the other hand, recumbent cases frequently succumb to the intercurrence of pneumonia, exposure and drowning.

Lesions.—In the cases examined the bones appear to be the only structures affected. Simple fractures have been noted in the humerus, femur, metacarpus, and in ribs, but in many long bones the appearance presented was as if the shaft had been torn away forcibly from its superior epiphyseal attachment. In general, the ribs are brittle and break easily. Fig. 1 shows the thoracic wall of a " crippled" lamb, and the series of swellings on the lower portion of successive ribs denote healing fractures which probably occurred during the act of parturition. Long bones often reveal diaphyseal distortion due to the deposition of layers of adventitious tissue of a calcareous nature around the shafts. Fig. 2 shows such a bone in longitudinal section, and the buttressing may be seen on the median aspect of the right hand bone. The bone on the left is from a normal lamb of about the same age. Fig. 3 shows the same appearance on the external aspect of the radius. Fig. 4 is a photograph of large metacarpal bones from a normal and a " crippled " lamb, which illustrates the brittle nature of affected bones. The right hand bone was removed post-mortem, when it was found that the distal end was chipped away above the line of ossification.

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Microscopically the lesion resembles a porotic malacia of sorts. Compared with normal lamb bones of the same age, sections from " crippled " cases show a poorly developed corticalis, slender bone trabeculæ, deficiency of osteoblasts, and some irregularity of endochondral ossification. These abnormalities result in the formation of bones probably deficient in both quantity and quality, and since resorptive changes dominate the picture, the result is a porotic bone.

Blood Analyses.—Samples of blood were obtained from twelve typical cases of " cripples " by the simple expedient of cutting a piece off the tail, and the plasma was examined for its calcium and phosphorus content. Expressed in mgs. per 100 c.c., plasma and Ca value (average) was 9.68, while the P figure was 8.23. Ten normal healthy lambs obtained from a farm where the disease is unknown was next examined, and the Ca average was 11.04 mgs ; P 13.05 mgs. Five recovered lambs were then bled, and the plasma examined. The average figures are Ca 10.84 mgs., P 11.06 mgs.

	Ca.	P.
Affected lambs	9.68 mgs	8.23 mgs
Recovered lambs	10.84 mgs	11.06 mgs
Normal lambs	11.04 mgs	13.05 mgs.

Discussion.

A brief description has been given of an interesting disease of lambs characterised by muscular stiffness, inability to flex the joints, and by abnormal fragility of long bones and ribs, resulting in their frequent fracture. The disease is known as " cripples," " stiffness," and also " rickets," and if uncomplicated is probably seldom fatal; but as many cases become unable to move, deaths from intercurrent disease are common, and ewes may deteriorate through improper suckling. Clinically, the affection resembles joint-ill in lambs, but there is an entire absence of sepsis, and the symptoms are probably related to imperfect osteogenesis, causing the formation of a type of bone deficient in quantity and/or abnormal in character.

" Crippled " lambs show symptoms resembling the so-called " stiff lambs " disease reported by Metzger and Hagan [1] as occurring almost enzöotically in the State of New York. Here the stiffness is stated to be due to changes in the muscles over the affected parts, these being described as " degeneration of the muscles with coincident connective tissue formation." Mild cases of " stiff-lambs " show muscles streaked with whitish lines running parallel with the fibres, while more advanced cases show streaks so numerous as to cause the entire muscle to assume a whitish colour (*op. cit.*). Greyish-white muscle lesions of a degenerative nature resembling the above described have occasionally been noted in " cripples " cases which have lain on the ground for five or six days, but their infrequent occurrence and absence in early cases indicate their distinction from the primary cause of " cripples," and suggest that they are probably secondary in nature. The opinion that the white muscle streaks in " stiff lambs " are of

secondary import is also given by Jungherr and Welsh.[2] The ætiology of " stiff lamb " disease is obscure, and although considered to be non-bacterial in nature, no satisfactory theory has as yet been advanced. Several bacteriological examinations have been conducted on suitable " cripples " cases killed for the purpose. Almost all the internal organs have been examined, using the ordinary aerobic and anaerobic culture media of the laboratory but with negative results. While a micro-organismal cause is not thereby entirely excluded, it may be added that no case has ever shown any of the common signs of bacterial activity.

Constitutional diseases of cattle and sheep associated with mineral deficiencies of the soil and herbage have been reported from many parts of the world, and it is germane to examine " cripples " in the light of this knowledge. Theiler, Green and Du Toit[3] clearly showed that in many areas of South Africa deficiency of phosphorus was the limiting factor in profitable stock farming, and that two important diseases—lamsiekte and styfsiekte—can be prevented by liberal bone-meal feeding. Later Du Toit, Malan and Roussouw,[4] discussing phosphorus in the nutrition of sheep, state that a deficiency in dietary phosphorus is rapidly reflected by changing level in the inorganic phosphorus of the blood. Further, under conditions of phosphorus deficiency animals lose weight. Blood analyses of twelve " cripples " cases gave an average figure of 8.23 mgs inorganic phosphorus, against a control figure of 13 mgs. While there is as yet a dearth of figures indicating the normal amounts of inorganic phosphorus in lambs, the figure obtained for " cripples " cases would appear significantly low, *viz.*, a 40 per cent. decrease in inorganic P (average figure). Also recovered lambs showed a rising inorganic phosphorus index running parallel with their improved state. In most deficiency diseases, on the other hand, the mother sacrifices herself by drawing on her skeletal reserves for the nutrition of the fœtus, and in aphosphorosis one would expect evidence of osteomalacia or osteoporosis in the bones of the dam. This has not been observed, but it is also true that no opportunity has presented itself for a detailed examination. Certainly the presence of healing fractures on the ribs of young lambs points to a dystrophic state of the bones before birth, and that the fractures probably occur during the act of parturition.

Bekker and Roussouw[5] record skeletal abnormalities with brittle bones in the sheep of the Bredasdorp district, and state that the sheep must be handled with care owing to the risk of fractures. The figure for inorganic phosphorus in the blood of these sheep is shown as less than half that of normal sheep. In Britain, Orr[6] has noted a disease of sheep occurring in parts of Scotland known locally as " croitich," which is characterised by softening and fragility of the bones, and it is thought that the condition is associated with a deficiency of calcium and phosphorus. The disease is most prevalent in growing sheep, but may also occur in fully grown adults. Orr[10] also states that one of the most important practical questions in connection with certain Scottish grazings, notably in the Highlands, is the depletion of minerals in rough pastures with consequent deterioration of stock.

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Chemical analyses of soils and pastures from farms affected with "cripples" have shown figures low in lime and phosphorus, and in a recent paper Shearer and Stewart[7] have found the content of calcium in the blood of sheep below normal as a result of the deficient nature of Northumbrian hill pastures. Evans[8] has noted stunted growth in mountain sheep and cattle grazing on pastures in Wales which are low in calcium and phosphorus. Consequently there is a certain amount of evidence tending to support the view that "cripples" may be an indirect manifestation of mineral depletion of the soil. On the other hand, the record of work carried out in South Africa shows that when osseous disorders were encountered in cattle and sheep, the deficiency of soil and pasture minerals (mainly phosphorus) was of a gross nature. In "cripples," however, there is no evidence of gross deficiency, and the animal mechanism must be credited with the ability to adjust or compensate deficiencies within a certain range, otherwise clinical evidence of deficiency would be much more frequent. Further, Theiler and Green[9] have pointed out that the absolute intake of phosphorus is determined mainly by the grazing requirements of the animal, so that low calcium and phosphorus figures for soils and pasture do not in themselves constitute evidence of their unsuitability for stock. It might well be that the absolute intake of phosphorus in the case of the ewes concerned merely falls below what is necessary for optimum requirements, and the question may now be put: does this factor operate in the causation of "cripples"?

Since this and related problems have an important practical bearing on sheep farming, it is proposed to institute fuller inquiries into the circumstances associated with the occurrence of "cripples." It is hoped that the experiments in connection with this investigation will have a bearing on cognate problems of sheep husbandry, and the work will be carried out under the Alan, Duke of Northumberland Memorial Bequest.

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THE INTERNAL PARASITES OF PIGS: A SURVEY.

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PORCINE parasitology is one of the oldest branches of veterinary medicine, and parasites still form one of the major causes of disease and loss in pigs. The subject is also intimately connected with public health, as the pig acts as an essential intermediate host for several important human parasites, and many of its worms are closely related to or identical with those found in man. When this intimate connection between pig and man was first observed is not clear. The Mosaic injunction against pork may have been a recognition of it; on the other hand, it may merely have been a continuation of some ancient taboo, persisting since the time that the pig was a "totem" animal. Certainly in the Middle Ages the undesirability of eating pork infected with measles (*Cysticercus cellulosæ*) was fully recognised, and as early as 1276 some German States had regulations for dealing with this condition. Later, with the discovery that pork was the main source of human infection with trichinosis, a fresh impetus was given to meat inspection, and a powerful stimulus was supplied to the young American Bureau of Animal Industry which was called upon to deal with the situation.

In recent years it has been found that the parasites of pigs often closely resemble those found in man, and their study in that animal has proved of great value in understanding their importance in human medicine. Some appear identical, and the pig acts as an important reservoir of human parasites. Others, morphologically identical, apparently cannot be transmitted to man, and the new and important conception of "biological strains" has been introduced into parasitology. The pig is parasitised by protozoa, flatworms and roundworms, but it is a peculiar fact that tapeworms are never found in the adult state in this animal. It will be most convenient to discuss these parasites by habitat rather than by their zoological affinities, and only important or common forms will be considered.

Blood.—A number of protozoan parasites have been reported from the pig, and among the trypanosomes *T. simiæ* is known to cause a very acute disease in this animal, as well as in monkeys. This species is closely related to *T. congolense* and may in fact be a *race* of that species which has become particularly virulent for pigs. A second species, *T. rhodaini*, has been reported from pigs from the Congo, but both forms are imperfectly known yet, and we have little real information as to the importance of the blood protozoa in this animal,

Muscles.—In the musculature occur the larval stages of two very important human helminths—*Trichinella spiralis* and *Tænia solium*. Neither is common in the British Isles, although both are known to occur. The adults of the former live in the small intestine, their larvæ being passed into the blood stream, so reaching the various muscles of the body where they encyst. The eggs of the latter are swallowed in the food, hatch in the intestine, and in a similar manner

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reach the muscles, where they become small bladder worms (*C. cellulosæ*). Where they occur, both necessitate a strict system of meat inspection or some form of legislation preventing the parasite being eaten in a viable condition. They are so uncommon in Britain, however, that no steps are normally taken for their prevention, reliance being placed on the British habit of overcooking pork. They are commonest in countries where raw or smoked pork products are common articles of diet, and in the case of *C. cellulosæ*, where human hygiene is poor. Prevention of trichinosis requires the proper housing of the pigs and the thorough cooking of all meat foods, and prevention of cysticercosis requires adequate human sanitation and the proper disposal of fæces. Another parasite not uncommonly seen in the muscles of the pig is *Sarcocystis meischeriana*, a protozoan parasite about which practically nothing is known, but which appears to be quite harmless. It reaches a length of about 2 mm., and its only importance lies in the fact that it may be superficially mistaken for a trichina cyst or a cysticercus. It is filled with small bean-shaped spores which easily differentiates it when alive; but all three when dead become calcified, and differential diagnosis is then more difficult.

Liver.—The common liver fluke of sheep (*Fasciola hepatica*), as well as several other species of trematodes, occur from time to time in the liver of the pig, but as a rule infection is not very serious. The larval stage of the dog tapeworm, *Echinococcus granulosus*, is not unfrequently found in this organ, however, when it forms the familiar hydatid cyst. Although this is not usually a serious parasite so far as the pig is concerned, such livers should always be destroyed, as they form sources of infection for dogs and other carnivores, which in turn form sources of infection for man.

Œsophagus.—In southern Europe and elsewhere, the apparently non-pathogenic nematode, *Gongylonema pulchrum*, is commonly seen living in a sinuous gallery in the muscosa of the œsophagus. It is transmitted by various beetles and cockroaches, but although the vectors are common in Britain, the parasite appears to be absent.

Stomach.—A variety of nematodes occur in the stomach of the pig, but only one of these, *Hyostrongylus rubidus*, is found in Britain. It is a slender, blood-red worm which can be easily observed with the naked eye, lying on the surface of the gastric mucosa. It is quite common in the south of England, but it has not yet been observed in Scotland. Its pathogenicity is still imperfectly known, and its development is direct. Elsewhere, especially in warm lands, *Arduenna* and *Physocephalus* are common pathogenic species, and in Asia a Gnathostome is also common. These three genera are carried by dung beetles and similar insects which must be swallowed by the pig.

Intestine.—The most important of all the parasitic worms in the pig is undoubtedly *Ascaris lumbricoides*, the common "roundworm." Not only is it most frequently found, but its pathogenic effects—especially in very young animals—are so severe that it is estimated in some important pig-rearing areas (including

Britain), that about a quarter of all pigs farrowed, die from its effects. These deaths occur at a very early age, and seldom come to the notice of the veterinary surgeon, so that the extent and cause of the loss is often totally unsuspected. Infection with Ascaris does not always cause death, however, and the economic effects are more obvious and the loss more serious. Infected animals are unthrifty, grow irregularly and slowly, and cost more to produce than do healthy animals. When the pigs in a litter vary in size and condition, Ascaris infection during early youth is the probable cause. How this comes about may be easily understood by a consideration of the life cycle. The eggs passed in the droppings of the sow and other older pigs (which often show no symptoms pointing to the presence of the worms) become embryonated on the floor of the sty, and in due course are swallowed by the young pig. They hatch in the intestine, and the embryo worms penetrating the mucosa are carried by the blood stream to the liver. Here they cause a considerable amount of damage, both traumatic and toxic, and the toxins are further carried to various organs, such as the kidneys, where extensive changes also occur. After a short time in the liver the embryos move on to the lungs, where still more traumatic damage is done. The young worms have been steadily growing in size, and although originally small enough to pass readily through the blood capillaries, they have now increased in size to such an extent that they rupture the lung capillaries and escape into the alveoli. They are carried mechanically by the ciliated epithelium of the bronchi and trachea to the mouth, and are swallowed for a second time. On this occasion, however, they do not leave the intestine, but settle down and become mature. The damage done by the adult worms is relatively slight and usually accidental. It is during the larval migration that extensive damage takes place, and unfortunately no known drug is of any use at this phase. Consequently, attention must be paid to preventive measures, and this has resulted in the development in America of the now celebrated M'Lean County system—a system which affords a striking example of the value of animal hygiene. Essentially this system consists in eliminating worms from the carriers, especially the sow, farrowing in a helminthologically clean environment, and keeping the young pigs in such an environment until they are large enough to be unaffected by the presence of the worms. Where this system has been adopted in the United States it has proved to be almost completely effective. Formerly, about 45 per cent. of all pigs farrowed were lost, now only 24 per cent. are lost, and this is loss directly attributable to poor feeding, breeding, management, or judgment. Pigs now grow normally, and reach maturity at least two months earlier than before.

Another serious parasite of the small intestine is the thorny-headed worm, *Macracanthorhynchus hirudinaceus*. Superficially it resembles an ascarid, but it can be easily distinguished from one by the presence of a thorny proboscis at the anterior end, and by the shape of the body, which gradually tapers towards the posterior end. It causes a serious local lesion, and the proboscis may penetrate the intestinal wall and initiate a fatal peritonitis. It is carried from pig to pig

by various species of beetles, but we are without any definite records of its presence in Britain.

Of less importance are the several species of hookworms found in the same habitat. These belong to the genera *Globocephalus* (which is related to the human and canine sub-tropical genus *Ancylostoma*) and *Necator* (which includes the human tropical hookworms), but little is known of their pathogenicity and, neither genus is found in Britain.

In the large intestine two common nematodes occur in this country. One is a bursate nematode—*Œsophagostomum dentatum*—and is a small white species living free in the lumen, and probably doing no harm as a rule. It does not appear to cause nodule formation as do some of its relations in ruminants. Other species of this genus of worms occur in the pig outside of Britain, and some of these do appear to cause nodule formation, however. The other common nematode in the large intestine is the whipworm, which appears to be identical with the human species and, like it, to be comparatively harmless. In the same habitat, in the great majority of young pigs in Britain, is found a ciliated protozoan parasite called *Balantidium coli*. It appears to be quite harmless to pigs, but it may be transmitted to human beings, in whom it causes a serious and sometimes fatal dysentery. It is curious that, considering the high rate of infection of pigs in Britain, no human cases are on record from this country.

Urino-Genital System.—Stephanurus dentatus, the kidney worm, is a very serious pest in certain parts of the world, but as its distribution roughly coincides with that of the human hookworms, it is only in moist, warm lands that it is important. It is completely absent from Britain and similar countries. The eggs, passed in the urine, hatch in the soil, and the larvæ, when they become infective, either are swallowed or penetrate the skin. In both cases they pass to the liver (and sometimes to the lungs), where they remain for about two months in an immature condition. At the end of that time they migrate to the urino-genital system, where they reach sexual maturity. They cause considerable damage both to the liver and kidneys, and form a serious source of loss to pig breeders. The M'Lean County system is an effective method of control, and it can be supplemented by hygienic wallows, drinking troughs and sties. Moist shade is particularly favourable for the worms.

Lungs.—In addition to the larval stages of various worms, the lungs of the pig are frequently infected by adults of the genus *Metastrongylus*. These live in the bronchi, which they mechanically obstruct, and their eggs and larvæ, together with the catarrhal exudate provoked by their presence, often occlude the alveoli, and cause a parasitic broncho-pneumonia. No satisfactory treatment is yet known, and nursing is the only course to adopt. The larvæ reach the soil in the droppings, and their subsequent development takes place in earthworms. These in turn are eaten by pigs, when the larvæ escape, penetrate the intestinal wall, and proceed directly, *via* the lymphatic system, to the lungs.

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Conclusion.—The important pig parasites in Britain are *Ascaris lumbricoides*, the various species of *Metastrongylus*, *Hyostrongylus rubidus*, and perhaps hydatid cysts. Abroad the kidney worm and the thorny-headed worm are serious pests where conditions are favourable, and the same may prove to be true in the case of the various hookworms. The parasites important in Britain do, however, by themselves constitute a most serious source of loss to pig breeders—probably at least as serious as that caused by the various more spectacular but more epizöotic bacterial diseases. All are preventable, and the main factors in their prevention are a knowledge of their life-histories and bionomics, and an intelligent application of the principles of hygiene to that knowledge. The present encouragement of pig breeding will increase their importance, and it is necessary for the veterinary surgeon to be fully aware of their presence, their pathogenicity and their prevention, if adequate steps are to be taken to keep them within bounds.

SWING BACK IN LAMBS.

By F. J. DUNNING, F.R.C.V.S.
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HAVING read the communications on the above disease in your journals of last April and May, I thought it might interest readers to know that this disease apparently exists in isolated instances in South Africa. For about three years previous to 1931 a local farmer lost a number of lambs annually from a form of creeping paralysis. In August, 1931, on visiting the farm, he showed me fifty-eight ewes and a balance of thirty-six lambs remaining from the lambing season which commenced the end of May. Four of these lambs showed posterior inability in general, corresponding to those described in the journals mentioned above. The condition of the lambs was good to start with, but the owner stated that it falls off as the disease progresses, and eventually death ensues, or the lamb is destroyed. None recover.

The mucous membranes were clear and pink, eyes bright, bowels normal, appetite good, but they lay prone to suck. A post-mortem on one revealed an entire absence of internal parasites, and all organs were healthy. The disease could not be associated with that form of paralysis due to the paralysis tick (*Ixodes pilosus*). Inquiries showed that the lambs were born healthy, and then the disease would manifest itself sometime during the first three months after birth, most frequently at about six weeks of age. By the end of September, 1931, about 50 per cent. of the lambs had been affected and slaughtered. One affected lamb was removed from the farm for observation and given abundant green grazing, also lucerne, dried forage, bran, and a daily dose of potassium iodide in sterilised bone meal for two months, but no improvement resulted. Two lambs were despatched to the veterinary laboratory, but no definite conclusions were arrived at. Soil samples taken from different parts of the farm and analysed here at the chemical laboratory showed a deficiency in phosphorus

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and lime, but that is a frequent condition. This year bone meal was fed to the ewes in the form of a lick, commencing a month prior to lambing, which commenced the beginning of June. Towards the end of July the owner observed symptoms of inability in two lambs, which he thereupon destroyed, and moved the flock to an adjoining farm, where no further cases occurred, and the flock returned in October. This was a satisfactory state of affairs, and although, owing to the owner's action in moving the sheep, one cannot draw definite conclusions whether it was the result of the movement or bone meal, or the combination, yet I think some credit can be given to the bone meal. In any case it warrants one giving it a further trial if opportunity arises. I have also heard indirectly that similar symptoms appeared on a farm in another district, and that a lick containing bone meal prevented its reappearance the following lambing season. Affected lambs, however, do not respond to the treatment.

Clinical Articles

Urethrotomy in the Bullock.

By H. J. LOVELESS, M.R.C.V.S.
Clacton.

I WAS called in to attend a bullock, about one year old, apparently in great pain. The owner had lost two bullocks with the same symptoms about a fortnight previously. The animal refused food, and was disinclined to move. On removing some hair from the prepuce, minute calculi were found adherent to the hair. As the bullock was not fit for slaughter urethrotomy was performed at the ischial arch. The animal was tied to a post, the area, udder, and tail shaved, and swabbed with tincture of iodine. Two c.c. of 3 per cent. solution of cocaine was injected. An incision, three inches long, was made over the urethra. No hæmorrhage occurred, and the urethra was exposed without further dissection. As soon as the urethra was incised a large quantity of urine escaped, and the bullock was released. He commenced to feed immediately. The urine dribbed continuously for about one month, when the bullock was observed to lift his tail and pass water like a heifer. I was on the farm about two months afterwards, and found that the bullock controls his urine, but passes it backwards like a heifer.

Intussusception in an Alsatian Bitch.

By H. J. LOVELESS, M.R.C.V.S.
Clacton.

AN Alsatian bitch, three years old, was brought to me with about four inches of bowel protruding from the anus. This had been out about two days, and previously (twenty-four hours beforehand) the bowel had been erroneously

diagnosed as rectum, and had been returned, and a suture (now broken out) placed across the anus. A thermometer was easily inserted between the anal ring and the bowel, indicating it was not prolapsed rectum. The bitch seemed quite in good spirits, and she was chloroformed, and an incision made in the middle line of the abdomen about three inches in length. The bowel was easily withdrawn from the anus, and the telescoped portion expressed. I should like to mention here that one should always attempt to express the telescoped portion instead of using traction. In spite of careful handling, a slight split had occurred in the invaginated portion, but as only the muscular coat was torn, nothing further was done to the bowel. A catgut suture was placed in the mesentery, and attached to the abdominal wall. The peritoneum and muscles were sutured together, and the skin separately, with interrupted silk sutures. The skin sutures were removed on the sixth day, and recovery was rapid. The bitch had no further prolapse.

Water Hemlock (Cicuta maculata L.)* Poisoning in Swine.

By LOUIS V. SKIDMORE, B.Sc. Agr., D.V.M.

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Introduction.

ACCORDING to available literature there are few definitely known cases of cicutism reported in swine. While it is generally believed that plants belonging to the genus *Cicuta* are poisonous to swine, there is a dearth of experimental evidence to verify this belief. Very little is known regarding the amount of various parts of the plant necessary to produce symptoms of poisoning or fatality in swine. Likewise, there is a lack of information concerning the comparative toxicity of the various species of water hemlock as well as the influence of locality and seasonal variations on the toxicity of *Cicuta*. It has been reported by some, among them Kunkel,[6] that swine are not poisoned with *Cicuta*. Others, Oeltze[8] and Scholler (1853),[11] report instances of cicutism in swine due to the eating of *Cicuta virosa L.*, which is the common and well-known species of water hemlock found in Europe. In a paper by O'Gara on " Poisonous Weeds,"[9] is a report that a hog was fed the roots of *C. maculata L.*, and at first refused to eat them. Further statements are : " The amount eaten at any one time did not exceed 20 grams, and this did not have any effect whatever. . . . However, had the roots been perfectly fresh, this quantity would have produced the symptoms of poisoning, if not death." More recently Warwick and Runnels[14] report the death of a suckling pig to which was fed one ounce of the tuberous roots of *C. maculata L.* in No. 000 capsules. The pig died four hours after being fed. The writer fed *C. maculata L.* to three swine in order to observe the effects of such feeding.

* The identification of this plant was verified by Dr. Frederick V. Coville, U.S. Dept. of Agr., Bureau of Plant Industry, Washington, D.C.

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Results of Feeding Cicuta maculata L. to Swine.

Experiment 1.—Red hog, weight 185 pounds. 27/5/31: 2.30 p.m., fed 500 grams of ground-up green tops; ate all, no symptoms. 28/5/31: 2.30 p.m., fed same amount as previous day; ate all, no symptoms. 29/5/31: 2.30 p.m., fed 200 grams of ground-up green tops; ate all, no symptoms. 30/5/31: 2.30 p.m., fed 1,200 grams of ground-up green tops; ate all, no symptoms. This animal did not show any symptoms of poisoning at any time during the feeding of tops. On 7/6/31, at 10.45 a.m., this same animal was fed 275 grams of the ground-up fresh roots of *C. maculata L.* mixed with a small amount of ground feed. The animal ate all readily. 11.10 a.m.—Nervous symptoms, marked restlessness, paws and roots bedding, champs jaws, grates teeth, and some frothing at the mouth, spasmodic twitching and contractions of the muscles of the lips and eyelids, dilation of the pupils, body tremors, respirations and pulse accelerated, curl lost from the tail. 11.30 a.m.—Animal goes down, severe convulsions, body rigid, agonal squeals. 11.35 a.m.—On feet, continuous trembling of body, increase in reflex excitability. 11.40 a.m.—Lies down, gets up again, goes backward, very restless. 11.45 a.m.—Goes down, severe convulsion, body rigid, agonal squeals, pulse and respirations very rapid. 11.50 a.m.—Animal gets on feet, falls over in convulsion. 12.20 a.m.—Paralysis, death. This animal made only very slight attempts of retching and vomiting. It did not vomit any of the material eaten.

Experiment 2.—Black hog, weight 55 pounds. 27/5/31, 2.30 p.m.—Fed 200 grams of ground-up roots in two handfuls of ground feed; animal ate all readily. 2.45 p.m.—Vomition, champs jaws, grates teeth, and frothing at mouth. 3.50 p.m.—Lies down, increase in reflex excitability. 4.15 p.m.—Respirations 90 per minute, heart beats accelerated. 5 p.m.—Smacks jaws, drinks a little water, refuses feed. 28/5/31, 8.30 a.m., eats and drinks, apparently normal. On 7/6/31, 10.45 a.m.—Fed this animal 200 grams of ground-up roots with two handfuls of ground feed; ate almost all. In a short time makes champing sounds with mouth, and grates teeth, slight salivation; did not vomit; no other symptoms observed. 8/6/31.—Eats and drinks, apparently normal. Discharged a week later, normal.

Experiment 3.—White hog, weight 65 pounds. On 27/5/31, 2.30 p.m.—Fed 100 grams of ground-up roots in two handfuls of ground feed. 2.45 p.m.—Champs jaws, grates teeth, salivation, vomition, restless, nervous symptoms, jerking of head, paws bedding, twitching of muscles of lips and eyelids, marked reflex excitability. 2.50 p.m.—Very restless, paws bedding, lies down, respirations 132 per minute, heart beats fast, and can be heard some distance from animal. 3.55 p.m.—Falls over, convulsion lasting for over one-half minute, body rigid, agonal squeals, and jerks head; respirations slower and deeper, mouth opened; gets on feet, falls on hind legs, gets on feet again. 4.15 p.m.—Lies down, respirations 126 per minute. 4.45 p.m.—Still lying down, respirations 138 per minute, heart beats distinctly heard. 5.30 p.m.—On feet, refuses feed, drinks a little water.

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28/5/31, 8.30 a.m.—Eats and drinks, apparently normal. On 7/6/31, 10.45 a.m. —This same animal was fed 200 grams of ground-up roots with a small quantity of ground feed ; animal ate all. In a short time makes champing sounds with mouth, grates teeth, slight salivation, no other symptoms observed. 8/6/31, 8.30 a.m.—Eats and drinks, apparently normal ; discharged a week later, normal.

Water Hemlock : Its Distribution and Habitat.

Cicuta belongs to the *Umbelliferæ*, or carrot, parsnip, parsley family. Several species have been described in the United States.[3, 7] Those most often mentioned, found in various sections of the west, south-west and north, are *C. occidentalis* (Greene) ; *C. vagans* (Greene) ; *C. douglasii* and *C. maculata L.* *C. bulbifera L.* may be found in the central, eastern and southern portions. The species most common in this section is *C. maculata L.* According to Peterson[10] and Britton,[2] *C. bulbifera L.* is also found in Nebraska ; and according to Petersen,[10] *C. occidentalis* (Greene).

Water Hemlock (*Cicuta maculata*), showing section of spindle-shaped root and lower stem, the leaves, flowers and fruit one-half natural size ; also fruit and cross section of seed enlarged five times.

Jacobson[5] says that after several years of study he concludes that *Cicuta* is an annual plant. His conclusion, however, is not in accordance with that of systematic botanists, who consider this plant a perennial. Some of the wild parsnips may be mistaken for water hemlock. However, these two plants can be distinguished by their root systems. The wild parsnips have a single root, while the root system of *Cicuta* is composed of spindle-shaped tuberous roots similar to a cluster of small sweet potatoes. Species of *Cicuta* are readily distinguished from poison hemlock (*Conium maculatum L.*), which also has umbels or clusters of small white flowers, but its leaves are fern- or lace-like in appearance. When the leaves of *Conium* are bruised, they give off an odour resembling that of mice. The stem of this plant is usually marked with purplish spots, while the stems of *Cicuta* are marked with purplish lines. Water hemlock is widely distributed throughout the United States, and perhaps can be found in every State in the Union. True to its name, it is a water-loving plant, and is found most often growing along the edges of streams, ditches, lakes, ponds, sloughs, and in

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wet meadows and pastures. Sometimes these plants are found growing in clusters, but more often they are found growing as single plants.

When the Plant is Poisonous.—It is generally believed that *Cicuta* is most poisonous in the spring of the year, and that with the growth of the plant the roots and tops diminish in toxicity. The roots, however, are poisonous at any time during the season. In early spring, when green vegetation is scarce, animals crave green plant food. Since there is usually considerable rainfall during this season of the year, water hemlock is more easily pulled up, and the roots are more likely to be eaten. Even during the dry season, hogs may root up and eat the fleshy tubers.

The Poisons of the Plant.—The principal active poison of *Cicuta* is a resinous, non-crystallizable substance known as cicutoxin, so named by a Frenchman, M. Brandes, in 1838. Van Ankum [12] and Boehm [1] have also obtained cicutoxin from water hemlock (*Cicuta virosa L.*). According to Jacobson,[5] this substance has an empirical chemical formula of $C_{19}H_{26}O_3$, and is a complex derivative of pyrone. He says that he has extracted cicutoxin at the rate of 0.3 to 0.4 per cent. of weight of tubers used. The plant is also said to contain a poisonous volatile alkaloid known as cicutine.

How Cicutoxin Kills.—This poisonous substance affects the central nervous system,[4] particularly those portions known as the cerrebum and medulla oblongata. Death is produced by asphyxiation and exhaustion.

Diagnosis of Cicutism.—The diagnosis of cicutism in swine cannot always be determined with certainty. The symptoms of marked increase in reflex excitability, intermittent epileptiform convulsions, rigid contractions of the muslces, agonal squeals, followed by paralysis and death, may lead one to suspect cicutism. On post-mortem examination no characteristic lesions are found, however ; the lungs and brain are often found to be highly congested. Parts of leaves and roots of the plants may be found in the ingesta. The musky odour of such contents may be characteristic of water hemlock. Access to *Cicuta* may also be helpful in making a proper diagnosis.

Prevention.[13]—This consists primarily in keeping animals away from the plants. One should be able to recognise water hemlock plants, and keep animals fenced away from those places where the plants are growing. It is not at all impossible, and in fact in most instances the best plan is to dig up or pull up the plants, hauling them to a safe place, allow to dry and then burn them. Even the dried roots are dangerous.

Treatment.—In animals such as swine, in which the act of vomition is readily induced, there is more likelihood of poisonous substances being vomited. Where vomition can be produced, a quick-acting emetic such as apomorphine is indicated. This may be followed by giving oils, grease, melted lard or milk. Sedatives, such as morphine, chloral hydrate, etc., are used sometimes to allay convulsions. Treatment, however, is usually very unsatisfactory. No specific antidotes are known to combat cicutoxin or other poisonous substances found in water hemlock.

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Summary.

The feeding of green tops of *C. maculata L.* did not produce symptoms of poisoning in a hog that ate nearly five pounds of the plant. Seven days later this animal ate 275 grams of the ground up roots of *Cicuta maculata L.*, and died in one hour and thirty-five minutes. Two other swine fed the ground-up fresh roots upon two different occasions lived. Prevention of cicutism consists in fencing animals away from those places where the plants are growing. The only sure method of eradicating *Cicuta* or water hemlock is to dig or pull up the plants and burn them.

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Poisoning of Pigs by Sodium Bicarbonate in Flour Sweepings.

By R. G. LINTON, Ph.D., M.R.C.V.S., and A. N. WILSON, B.Sc., A.I.C.

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SUCCESSFUL pig rearing depends upon many factors, not the least important being the use of good food, the constituents of which are so balanced as to meet the needs of the animal. Pig keeping being what it is at the present time, many feeders look for "cheap" food, and make use of offals of various descriptions, many of which cannot by their nature be expected to yield satisfactory results.

Bakery and mill sweepings are refuse materials that are readily purchased by owners of pigs and poultry, and they form a cheap addition to a diet, provided that they are sound and that their nutritional deficiencies, particularly protein and minerals, are made good by the addition of suitable ingredients. Not infrequently, however, these refuse materials are quite unfit for use as food owing to decomposition or to careless admixture with commodities which may be beneficial if supplied in physiological doses, but which may be definitely harmful if fed in excessive quantities. Thus we have met with the poison of ducks by salt, the sweepings from a bakery containing over 20 per cent. of salt which had been carelessly swept up with flour refuse.

An unusual case of poisoning by sodium bicarbonate was recently brought to our notice by Mr. D. Cameron, M.R.C.V.S., who supplied the clinical record and some of the " sweepings," for analysis. A pig-owner purchased a fresh supply of " flour sweepings " which were boiled, mixed with food and fed to the pigs. To begin with, the pigs refused the food containing the sweepings, and the quantity of sweepings was then reduced to form a very small portion of the ration ; the pigs then took it willingly. This ration was fed for about ten days, and no ill-effects were observed. At the end of this period the sweepings were again increased, and three days later five sows became ill and refused any food. They were very thirsty, and drank " wash," or any liquid they could reach. They appeared to be in pain, and stood with their heads lowered, oblivious to their surroundings, they staggered on the forelegs, and squealed when forced to move. At this stage the owner suspected the sweepings and ceased to use them. Milk in abundance was given to the sick sows, and, with the exception of one, all of them recovered. The owner destroyed one sow, as it seemed to be in great pain, and was in fact on the point of death. At the time of the illness all the sows were suckling litters which remained healthy.

A post-mortem examination was held on the sow that was killed, and the only lesion found was a large inflammatory patch on the stomach, which was definitely circumscribed and had a peculiar charred appearance. The stomach wall at this part was œdematous, and was thickened to the extent of about half an inch.

The sweepings were found to have the following composition :—

Water	8.30	per cent.
Protein	2.84	,,
Fat	1.23	,,
Carbohydrate	63.46	,,
Fibre	*Nil*	
Total Ash	24.17	,,
	100.00	

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The constituents of the ash which were determined were as follows:

Silica-free ash	23.85	per cent.
CaO	0.12	,,
P_2O_5	0.16	,,
Cl	0.14	,,
MgO	0.13	,,
K_2O	0.66	,,
Na_2O	12.21	,,

The sodium was in the form of sodium bicarbonate, of which there was 33.7 per cent. present in the meal. This record shows how necessary it is for owners of stock to exercise great care when purchasing foods of this nature.

H. A. Reid* has recorded the death of 150 sheep as a result of drinking water into which had drained the effluent from a dairy factory which contained large quantities of sodium carbonate. One of us (R. G. L.), when inquiring into the death of over a hundred pigs in a piggery, found that the alkali used for cleansing the milk utensils had been accidentally discharged into the milk residues given to the pigs; in this case there was very extensive necrosis in the stomach and throughout the small intestines.

Pig Practice in Suffolk.

By J. M. BUCHANAN, M.R.C.V.S.

Stowmarket.

SEVENTY-FIVE per cent. of our practice in Suffolk is among pigs, and it follows that our knowledge of their ailments is a *sine qua non* of the competent practitioner. The East Anglian custom of speying makes for a divergence in practice from that of other districts. On one's proficiency therein hangs the prospect of success or failure in practice here. Unfortunately, many veterinary surgeons fail to interest themselves therein, and as a consequence the unqualified man flourishes in Suffolk to a degree unknown elsewhere. Many of these men are trained by ourselves, and so they become literally "foes of our own household." To stress this point, and to show the damage done, it is a well-known fact that after operating these men are asked for advice on ailments, both to their pecuniary advantage and prestige.

The diseases of pigs, like all other domestic animals, are legion, and yet to our sorrow, our knowledge thereof leaves much to be desired. At present erysipelas is much in evidence, but is one of the diseases of pigs amenable to treatment. To obtain best results from serum inoculation, starvation for three days is a necessary adjuvant, as the disease is invariably associated with high living. Pig owners are now realising the value of the preventive serum and vaccine, as one

* THE VETERINARY JOURNAL, Vol. lxxviii, 1921, p. 177.

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has then no cessation in fattening such as occurs when erysipelas breaks out in a herd. Swine fever, like the poor, is always with us. The writer had recently the doubtful pleasure of discussing the state of our knowledge in the JOURNAL. In the present state thereof there is little further to be said. Many pig owners fail to realise that the Acts and Orders, irritating as some of their restrictions may appear, are really for their own benefit. Till the day comes when pig keepers realise this fact and learn to observe them both in the spirit and in the letter swine fever will always be a bug-bear to the successful rearing of swine.

Dietetic errors form a large proportion of the illnesses for which the veterinary surgeon is called upon to prescribe, and swine ailments form no exception to this rule. Frequently one is called to investigate the cause of death among feeding pigs. On post-mortem the predominant, often the only, lesion is acute gastritis frequently ulcerative in character. On suggesting a lowering of the diet, one is informed that no change has occurred therein, and that the ration under discussion has been the practice for years. For want of a better, I use the term gastric toxæmia for this condition, but am at a loss to account for the disease. At one time part of the duties of the writer was the meat inspection at a local bacon factory. As one would expect, tuberculosis formed the largest number of causes of seizure ; the usual site, of course, was the submaxillary lymph glands. One case to the writer's mind must be unique. A batch of twenty pigs were all seized : all the carcase glands showed advanced caseation. The lungs and other internal organs were free. The diet was a mixed meal—bran, etc. Where did the primary infection originate ? No milk was fed.

A point that arises in most bacon factories is the aptitude shown by pig keepers to use such as a convenient means for ridding themselves of ailing pigs. Do they realise the danger to public health, or is it (probably) out of sight, out of mind ? This was very clearly shown during the swine fever epidemics of 1929–1930. Scores of carcases were seized, and the owners notified that swine fever was suspected. The bacon factory and the market are a convenient hiding place for such cases unless detected.

Abstracts of Current Literature

The Pig Industry : Report on Conditions in Great Britain and America, with suggestions applicable to Australia. By R. B. KELLY, B.V.Sc. Commonwealth of Australia Council for Scientific and Industrial Research, *Pamphlet No.* 28, Melbourne, 1932.

DURING a visit to Europe and America the author was requested to collect some information on the above subject, and the Report is the result of his observations. The Report is divided into an introduction and seven parts, probably the most interesting of which is part seven, which deals with abnormal and

pathological conditions affecting production costs. It appears that Australia consumes much less pig products, and possesses many fewer pigs per head of the population than other countries. (An interesting table illustrates this point). The author is of opinion that England promises to remain the only overseas market for any great quantity of Australian pig products, especially for bacon carcases as opposed to pork carcases, and he lays down certain conditions to which carcases should subscribe in order to encourage further export. He sees no reason why Australia should not be able to develop an extensive overseas trade in frozen pig carcases. He deals fully with the American and Danish methods of rearing and feeding pigs, and of preparing carcases for export. The section dealing with abnormal and pathological conditions has chapters on the causes of small litters and deaths at birth, in which excessive or defective rations at and before the time of mating, inbreeding, contagious abortion, are all shown to play a big part; death soon after birth, in which the care and attention of the sow during and after parturition, coupled with efficient management, will do much to control; sanitation, and the McLean County system for parasitic control, with a summary of this well-known method; paralysis in pigs, due most probably to mineral and vitamin deficiencies, injuries, etc.; seedy belly of the black, red and white varieties; soft pork, which is closely associated with the food supply; and yellow fat, believed to be due to many causes, one of which is undoubtedly the type of feed. Illustrations of the various breeds of pigs are produced. The Report certainly is meant for Australian readers mainly, but much of the information contained applies to the pig industry generally, and for that reason the Report is well worth reading by all interested. The author appears to have made excellent use of the opportunities afforded him for the collection of information.

European-Owned Stock in Northern Rhodesia: *Annual Report of the Department of Animal Health for* 1931, J. SMITH, M.R.C.V.S., D.V.H., Director.

THE statistical number of pigs is given as 3,305, and in connection with these the Director reports :—

" Although more evidence is available that the possibilities of pig breeding are realised, no great advance can be expected until the dairy industry is established. The feeding of pigs is so intimately connected with milk production that the two industries must advance together. The closing down of the two creameries which have been established in the past has caused certain farmers to use their surplus milk in pork and bacon production. Extravagant as this may seem, they have stated that it has by no means been unremunerative. The small numbers which are kept still causes their disposal to be somewhat difficult, because buyers are anxious to arrange for continuous supplies in such numbers as they require. Whilst the pig industry is growing, co-operative disposal in districts would appear to be essential if satisfactory terms are to be arranged. The amount of pork, bacon

and hams imported demonstrate the demands which exist. Under hygienic conditions pigs do well in the the Territory, and a considerable advance in the industry is anticipated when a ready sale is found for the cream produced."

In a further paragraph dealing specially with pig diseases, the Report states that: "Feeding tests with diplodia-infected maize with pigs proved negative. Cases of hookworm disease in pigs were observed. Four cases of necrotic colitis from two widely separated farms (over forty miles apart) were investigated. An organism isolated in pure culture from the mesenteric lymph glands proved pathogenic to rabbits. This, together with the lesions, is strongly suggestive of a paratyphoid in pigs. The mortality from the disease was low."

The Life Cycle of Stephanurus dentatus, Deising, 1839: The Kidney Worm of Pigs.—By I. CLUNES ROSS, D.V.Sc., and G. KANZAL, D.V.Sc., Commonwealth of Australia Council for Scientific and Industrial Research, Melbourne, 1932.

THIS very full Report is divided into four sections:—

(*a*) *Distribution and Economic Importance.*—Infestation of pigs with the worm is prevalent in Australia, in some districts 70 per cent. of all pigs killed in the abattoirs are found infected. The adult worms do less actual damage than the immature forms, which produce lesions in the liver. Economically the infestations are of great importance, in that heavy infestation means total condemnation of the carcase, and even moderate infestation prevents exportation to Europe. The number of cases and severity of infestation are increasing.

(*b*) *Pre-parasitic Stages in the Life Cycle.*—A full description is given, from which we learn that the egg may hatch in twenty-four to thirty-six hours, and the larva undergoes two metamorphoses before reaching the infectious stage in 95 to 120 hours, and may then remain in soil, etc., for 154 days. Desiccation soon destroys eggs or larvæ, and for this reason larvæ tend to migrate to deep mud layers. Eggs and larvæ are readily killed by antiseptics. In one experiment all were killed when mixed with mud and sprayed with 10 per cent. copper sulphate and 5 per cent. Kerol.

(*c*) *Parasitic Stages in the Life Cycle.*—Pigs and guinea-pigs can be infected by the alimentary tract, or through the intact skin. The worm goes through four stages after ingestion or passing through the skin, the fourth stage being recovered from the liver as early as three days after oral infestation, and in eight to forty days after skin application. The complete change from the fourth stage to the adult young worm takes place in the liver in under two months. The worm remains in the liver and vicinity for five to six months, and then migrates to the kidneys and ureters. After six months egg laying begins. Immature worms may be found in the lungs and lymphatic glands. The opinion is expressed that migrating larvæ and worms progress by direct penetration of the tissues rather than by way of the blood and lymph streams.

(*d*) *Control and Eradication.*—Efforts should be made to eliminate muddy areas which become contaminated with urine and fæces, and so are sources of danger. The use of hygienic feed troughs is advocated, and the spraying of muddy areas with the above disinfectant solutions. The drying of pens, etc., by means of sunshine is advised, and details of segregation of infested stock, and the handling of young clean stock are given. The Report is well illustrated, and is an excellent record of carefully controlled work, which is of the greatest interest to the veterinary profession, and especially to students and workers on parasitology.

Tuberculosis of the Small Intestine in Swine.—By Dr. BERNARD MULLER, Meat Inspector in Reichenbach. *B.T.W.*, No. 33, August 12th.

MULLER refers to the belief that intestinal tuberculosis in swine is exceptionally rare, and to the view that if the mesenteric glands show neither calcification nor caseation, the intestine is free. He believes that the occurrence of spontaneous intestinal tuberculosis in swine is still doubted, and considers this wonderful, when about twenty million pigs annually are slaughtered in Germany, and undergo official inspection. On July 24th, 1931, a ten-months-old sow, weighing 260 lb., was killed. She was very well fleshed. There was miliary tuberculosis of the lungs. Caseous nodules in the liver and spleen; pharyngeal glands on both sides as big as one's fist; tuberculous nodules in mesenteric and portal glands. On the small intestine itself two pea-sized nodules of a greyish-yellow colour were found under the serosa. In the whole length of the split intestine, nodules were found in the mucosa, submucosa and muscularis. An ulcerative degeneration of the nodules was not found. The establishment of the condition was made clear when the intestine and its glands were examined, and when this is not done, as is generally the case in meat inspection, numerous cases of intestinal tuberculosis in swine may be overlooked. Actually intestinal tuberculosis in swine may be more frequent than appears, according to literature. At the abattoir at Plauen there is a prepared specimen of intestinal tuberculosis in swine. The tuberculous piece of small intestine found in this case was histologically examined at the Veterinary Pathological Institute of the University of Leipzig, and remains there, and its tuberculous nature was established. Considerable changes in the mesenteric glands of swine should always be followed by a thorough examination of the related piece of intestine before the carcase is declared free.

Gall-Stones in Swine.—By Veterinary Surgeon Dr. KLUPSCH, of Sohland. *B.T.W.*, No. 33, August 12th.

AN eight-months-old pig was slaughtered on account of failure of appetite and loss of condition. In the greatly thickened gall-bladder, in addition to gravel, forty gall-stones were found, from a pin-head to a cherry stone in size. The gall-stones were roundish-oval in form, of dark-brown colour, and were

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easily crushed between two fingers. During life no certain diagnosis could be made: no fever, laboured breathing, vomiting, nor icteric or exanthemous discoloration of the skin. On hanging for twenty-four hours the flesh and fat became soft. All else was negative. During the last ten years no case of gall-stones in the pig has been recorded in the *B.T.W.*

The Cause of Muscle Hæmorrhages (Splashing) in Electrically Stunned Calves.—By Dr. MAX MULLER, of Munich. *Deutsche-Schlachthof-Zeitung*, September, 1932.

THE occurrence of muscle hæmorrhages in the employment of the electric current is always due to its faulty application. Two factors cause the "splashing": (1) The too long operation of the current on the animal's body through the brain; (2) the too long operation of a too high tension or too strong current. Momentary electric stunning occurs when a general muscle tetany arises through the operation of the electric current which I have designated as electrospasmus. The spasmus of the muscularis of the blood vessels of the heart muscle and of the general musculature causes a hindrance to the circulation of the blood, and this momentary checking of the nourishment of the brain with arterial blood, and simultaneous stasis of blood in the venous system, causes a destruction of the activity of the brain, and brings about unconsciousness. The collective tetany of the musculature acts prejudicially to the activity of the heart, at least whilst electrospasms continue. The continuance of this detriment to the activity of the heart is dependent on the continuance of the operation of the current on the brain. If the animal is kept too long in electrospasmus, or the heart injured by a too high tension or too strong current, a too severe injury to the heart's activity occurs through too strong stasis of the blood in the venous system. This leads to capillary blood extravasations, when the stasis, as a result of heart muscle contraction, is too strong and too long, or the heart muscle itself suffers injury in its vitality and normal contractility. One can easily produce muscle hæmorrhages if one keeps the animal body too long in electrospasmus of the muscles, heart, and arterial and venous blood vessels.

Now the individual races of animals are variously susceptible to the effect of the electric current on the brain. Calves and sheep especially are more susceptible than pigs. The current used in swine without producing muscle hæmorrhages will cause "splashing" in calves and sheep as soon as it is applied too long. This operation causes such an injurious influence on the heart that the heart muscle never recovers its full contractile power. In calves and sheep a not too strong current, and a shorter application of it, must be used to produce stunning than in swine. As far as I have observed, this occurrence of muscle hæmorrhages, especially in calves and sheep, occurs at the beginning of the employment of electric stunning, through too long operation of the current on the brain. Muscle hæmorrhages in both shooting and electric stunning occur from the same cause.

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In both cases the hæmorrhages are caused by heart muscle weakness brought about by venous stasis of the blood. There is a loosening of the capillary endothelium with the occurrence of blood ecchymoses in the connective tissue of the musculature. In shooting, therefore, the quickest possible bleeding must be carried out so that the flagging heart muscle causes no such venous stasis of the blood as to bring about hæmorrhages through loosening of the capillary endothe lium, and in electric stunning the current must be so used that the heart can soon regain its full power of action uninjured.

Erythematous and Papulous Dermatoses of Veterinary Surgeons after Vaginal Work in Cattle. Dr. L. RIEDMULLER and Dr. H. STIHL, of Stein a. Rh., *Pathological Institute of the University of Zurich. Schweizer Archiv f. Tierheilkunde*, December, 1931.

RECENTLY notice has been taken in human medical literature of the skin affections veterinary surgeons are liable to in the course of their calling. These dermatoses occur more frequently than the sparce references to them in literature would lead one to infer, and whilst in most cases only harmless and transient affections, yet they may compel the practitioner to avoid practice for a time, or at any rate to eschew operative interferences in cattle. Recently, along with Dr. W. Jadassohn, we had the opportunity of studying a case here in which there was a papulous skin rash and urticaria which, after examination by four of our confrères, was considered to be a Bang infection. Earlier authors have recorded cases of bullous dermatitis in veterinary surgeons (Dietel, Spengler, Urbach). These cases were accompanied by febrile symptoms (undulant fever). The case seen by us corresponded with those seen by Huddleson and Johnson, and Haxthausen and Thompson. These authors describe a Bang infection from an infected afterbirth whose course is unaccompanied by fever or general reaction. They distinguish two classes of symptoms: (1) An erythema that occurs quickly and declines after a short time. It appears as irregular reddish spots on the skin, or it occurs as a diffuse redness of the whole surface of the forearm. There is an intense itching or burning feeling. The redness of the skin disappears in four to eight hours. Exudations or desquamations were not noticed. (2) The second type is recognised by small or slightly raised reddish papules, which are not so profuse as in the first type. Itching is very intense. The papules often remain three or four days. The reddish hue gradually changes into dark brown. Exudate and desquamation do not follow according to these authors.

The following are the clinical symptoms of five cases of Bang infection of the skin described by Haxthausen and Thompson, and in none of them were there any general symptoms: Susceptible veterinary surgeons were affected after parturition, sterility, or removal of the after-birth work. The parts attacked were the arms, the breast, the neck, or, rarely, the eyes. There was itching, due to follicular, linseed-sized papules, which were hard and infiltrated, and

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bright red. When at its height little vesicles arose which formed pustules, and later dried off as brownish scales. In severe cases the papules became confluent, so that the skin appeared infiltrated. The older the process, so much more the original bright-red colour turned into a brown hue. No general symptoms such as fever and glandular swelling. The rashes arose in a few hours, and reached the maximum after twenty-four to twenty-eight hours, disappeared after a few days to three weeks, unless fresh infection from new material caused a return of the malady. Our case was very similar, except that the patient showed eczema, the cause of which could not be determined. The skin changes were as follows: (1) On the arms, follicular, pin-head to linseed-sized, hard, papulous inflorescences and areola. (2) Some eczematous plaques on the fore-arms and back of the hands. The skin affection had appeared six months previously. It kept always recurring, especially after parturition cases of long duration—the arm almost immediately became reddened and inflamed with swelling of the skin. These urticarial symptoms disappeared in one or two hours. Many times, but not in every case, follicular papulous efflorescences arose as described by Haxthausen and Thompson. It could not be determined whether these different symptoms only arose from contact with a Baug infected animal. The papules and pustules occurred also on the breast, but only slightly.

The authors made skin tests to determine whether their case was due to Bang infection, but after much investigation came to the conclusion that it was not so in this case. Nevertheless, they consider that probably most cases of papulous and pustulous affections of the arm are due to Bang infection. A questionnaire addressed to 325 Danish veterinary surgeons showed that 105 had experienced these skin affections, and it was also ascertained that 17 per cent. of Swiss veterinary surgeons had at one time or another been affected similarly. In some cases it is believed that the affection is due to a bacterial toxin, or to some substance occurring in the normal cattle organism. Antiseptics and ointments, and soaps have all been used with success as prophylactics and curatives. In some cases an anti-virus has been prepared, and each evening the ailing arm has been rubbed with a dose of 20 c.c., and in course of time complete cure has resulted. In most of these cases staphylococci were found in the contents of the pustules.

The Electric Stunning of Animals for Slaughter. By MAX MULLER. *Deutsche Schlachthof-Zeitung*, December 10th, 1932.

THE Electro-Technical Union of Charlottenburg, Berlin, held a sitting on November 29th, 1932, to discuss the above subject. The meeting of associates and guests met in the large lecture room of the new Physical Institute of Technology of the Charlottenburg School. Chief Engineer Alvensleben, insurance agent to the Association, gave an account of some accidents with electricity that had come to his knowledge and experience, and the measures he advocated to avoid them. About 800 people interested attended the meeting.

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Cinematograph pictures were shown of the physiological effects of electric currents on the brain, heart, and blood vessels, the stunning effect of high-frequency and interrupted direct currents, and the hitherto slaughtering procedures by the pole-axe, shot, and shechita. Practical demonstrations were given by Chief Engineer Weinberg, of Munich, on the stunning of fowls, turkeys and fish. Two persons injured by accidents were shown. In one case the man's head came in contact with a high frequency current, and he was rendered unconscious, but showed no evidence of pain at the time, although later he was treated for severe burns to the head, eyes and skull; in the other case the injured man lay unconscious for two hours, and as if in a deep sleep. An interesting discussion ensued, taken part in by doctors, veterinary surgeons and engineers.

Professor Bongert and Dr. Junack expressed views against the stunning effect of electricity. Their views were contested by Weinberger and Professor Max Müller. Medical opinion was unanimous that the electrospastic influence on the blood vessels and the tetany of the muscles by hindering the circulation of the blood brings about a general functional destruction of the activity of the brain, with the effect of producing instant unconsciousness and its results (loss of equilibrium, sensation, sight and hearing, etc.). Professor Kreuzfeld demonstrated an interesting series of sections of brain injured by electricity in the U.S.A., one of which was a human brain. The sections showed the contraction of the blood vessels bringing about unconsciousness *intra vitam*. Of especial interest were the accounts of the directing engineers of the use of electric stunning in the whale fisheries of the southern arctic ocean. The extermination of the whale in this way had brought cheaper margarine; but from the point of view of animal protection, however, had been discarded. The electric stunning of the whale was brought about by a harpoon furnished with an electrode near the head with a current from the ship through a second pole.

The presence of prominent engineers, doctors, veterinary surgeons, and members of animal protection societies, showed a lively interest in the subject, the cinematograph pictures and the animal tests. Many German official veterinary surgeons were present, also meat inspectors, and professors from the Universities of Leipzig and Berlin.

Studies on Bovine Mastitis. VII—The Serological Characters of Mastitis Streptococci. By A. W. STABLEFORTH. *Jnl. Comp. Path. and Therap.* (1932). **45**, pp. 185–211

A STUDY has been made of the serological characters of 160 strains of streptococci from different quarters of 151 animals. Of these strains, 110 were from the secretion of severe cases. The streptococci belonged to the Groups I, II and III, into which it has been already shown streptococci from cases of bovine mastitis can be arranged on cultural and biochemical grounds. (*Jnl. Comp. Path. and Therap.*, **42**, 213; **44**, 114; **45**, 43.)

It is shown in this report that each of the groups can be further divided by serological methods. The number of strains of each group examined, and the serological types recognised were as follows. Group I.—Ninety-one strains which in general characters corresponded with the group of streptococci which are the most common cause of chronic bovine mastitis (the so-called *S. mastiditis* or *S. agalactiæ*) ; 61 strains were of type I*a*, six of type I*b*, and 24 of type I*c*. Group II.—Twenty-nine strains: 12 strains were of type II*a*, 10 of type II*b*, and three of type II*c*. Three strains had antigens belonging to each of these types. Group III.—Forty strains: Five strains were of type III*a*, one of type III*b*, and seven of type III*c*. Two strains gave partial reaction with sera of both types *a* and *b*. Twenty-five strains gave a negative result with all sera.

Of the 91 strains in Group I, 55 were hæmolytic (β), and 36 non-hæmolytic (α or γ) in ox-blood agar plates. Hæmolytic and non-hæmolytic strains were present in type *a* and in type *b* of this group, and were found to be alike by direct tests, and by absorption with graded amounts of organisms. All strains of type *c* were hæmolytic. Groups II and III contained only non-hæmolytic strains. Except in regard to hæmolysis, strains of the same serological type were alike biochemically. Strains which behaved similarly in biochemical tests, *i.e.*, strains of the same group, did not necessarily belong to the same type. Strains of different biochemical groups were entirely distinct serologically. In certain cases types within the same group showed a minor degree of likeness due to subsidiary antigens. These relations are fully discussed at the end of Part I of the paper which deals with the methods used. The methods were: precipitation at 50°–55° C., using extracts prepared with hot M/20 HCl in saline ; agglutination, using a rapid naked-eye slide technique at room temperature, and the corresponding absorption tests. Immune sera were rendered type-specific by preliminary absorption to remove subsidiary antibodies. Tests for specific absorption were carried out with one to two minimal absorptive doses as judged from the serum strain, or with graded doses.

The precipitation method was applicable to all types of streptococci except those of Group III, which are apparently deficient in the type-specific protein required for this test. The slide agglutination method, which was carried out with thick suspensions on ordinary slides on which six cells of standard size had been made by means of a stencil and grease pencil, gave easily-read and reproducible results, and by the methods described tests for both direct agglutination and for absorption of agglutinins were carried out quickly with minimal amounts of serum and suspension. Suspensions which were not sufficiently stable for tube agglutination tests at higher temperatures were in general satisfactory for slide tests. A few strains always gave granular suspensions, and could only be dealt with by agglutinin-absorption or by precipitation. In Groups I and II the results of precipitation and agglutination were in general parallel. The types described are serologically distinct from strains of *S. pyogenes*, *S. lactis*, and *S. cremoris*.

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A Note on Simulium sp. attacking Horses and Cattle in Herefordshire. By J. S. STEWARD. *Second Report of Director of Institute of Animal Pathology, Cambridge.*

THE writer, prompted by the scarcity of veterinary references to *Simulium* attacking animals in this country, has recorded the attack of horses and cattle by females of *S. ornatum* and *S. latipes*. The flies were taken from the ears of horses and calves during April, the ears showing lesions of previous bites (up to fifty in each year), recent bites being marked by oozing blood or serum, and older bites as small spots of dry clotted blood. A short description of the stages of the fly and its life history are given, and the breeding place was traced to a swiftly running stream at a distance of three-quarters of a mile, where the larvæ and pupæ were found attached to stones or vegetation in the swiftest parts of the stream. Reference is made to the annual losses of cattle and sheep in Central Europe from the bites of enormous swarms of these flies; most recorded attacks occurring in April and May of each year. Blacklock is quoted as having shown that *S. damnosum* is the vector of *Onchocerca volontus*, a nematode parasite of man; and it is also mentioned that *S. venustum* is suspected of being a vector of *Leucocytozoon anatis*, which is sometimes associated with a heavy mortality of ducklings in North America. A list of references is given.

Experiences in Eradicating Bang's Disease in Three Infected Herds of Cattle.—C. F. CLARK. *Jour. Amer. Vet. Med. Assn.*, LXXXI, 54 (1932).

IN this paper the author relates experiences in attempting to eradicate Bang's disease, and discusses the significance of low agglutination titres, and the frequency of abortions in negative reacting animals. The method of control in the three herds was the frequent application of the agglutination test, and the segregation of negative from positive reacting animals. Agglutinations were made by the rapid plate method, and the amounts of sera mixed with antigen corresponded to dilutions of 1/25 to 1/500. Serum showing incomplete reaction at 1/25 was taken as negative; complete reaction at 1/25 and 1/50 was called suspicious, while positive results at 1/100 or above were accepted as definite evidence of infection. Herd A consisted of sixty dairy cattle, mostly young cows and heifers. Bang's disease had existed for several years, and when the study began there was only one positive animal in the herd. Monthly tests were made on all animals of breeding age, and tables are given which show that two heifers and seventeen cows were entirely negative. At 1/25 trace reactions were found in one heifer and eleven cows, partial reactions in one heifer and sixteen cows, and positive reactions in five cows. Only one cow agglutinated above this titre. The five cows positive at 1/25 all had a normal breeding history, though in each case the fœtal membranes were retained. Three cows in the herd aborted (two gave negative reactions, and one a trace at 1/25). In no case, however, was it shown that they were infected with *B. abortus*.

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In herd B, Bang's infection had existed for several years in a virulent form. From the results of agglutination tests the herd was divided into positive and negative cows. The two lots were grazed separately. Twenty-two new animals were added to the herd, and kept in a new building. They were found to be negative, and were then added to the negative portion of the herd. Ultimately all positive reactions were sold for slaughter. Among the consistent negative reactors, 8.1 per cent. aborted, but *B. abortus* was not isolated in any case.

Herd C consisted of beef cattle of all ages. Bang's disease had existed for several years. The herd was ultimately reduced to contain only definite consistent negative reactors. Seven animals which reacted at a titre of 1/25 never aborted. The author thinks that such reactions are caused by non-specific agglutinins. From his observations the author concludes that Bang's disease was apparently eradicated by a frequent application of the agglutination test, and permanent segregation of positive reacting cattle. He also concludes that the abortion rate of animals having a maximum agglutination titre of a trace or incomplete reaction at 1/25 does not vary appreciably from those showing a definite negative reaction.

An Interesting Case of Tuberculosis in a Horse.—K. HORMANDINGER. *Wien. Tierarztl. Mschr.* 18, 782.

A 2½-year-old black stallion of Hungarian origin was tested with mallein because of the presence of a nasal discharge of a suspicious nature. The reaction was negative. A further examination of the horse showed a discharge from both nostrils, swellings of the lymphatic glands in the region of the throat to about the size of a hen's egg, and an ulcerous condition of the skin of the left side of the neck with lymphatic vessels thickened to about the size of three fingers extending from the affected area. The horse was slaughtered, and post-mortem examination showed in the upper third of the nasal septum two raw-like areas with a ragged edge. The lungs, which were practically solid, showed innumerable whitish grey nodules about the size of a millet seed. Bacteriological examination of these areas yielded tubercle bacilli.

Some Nematode Parasites of the British Fallow Deer in Dama Dama. By J. S. STEWARD. *Second Report of the Director of Institute of Animal Pathology, Cambridge*, 1931.

THE occurrence of *Cooperia oncophora*—previously unrecorded from deer—is reported in Dama Dama. *Capillaria sp.* is also recorded for the first time in fallow deer; and *Œsophagostomum venulosum* and *Nematodivus sp.* are recorded for the first time in fallow deer in Great Britain. Reference is made to a list of "The Helminth Parasites of Deer" (1931), issued by the Imperial Bureau of Agricultural Parasitology. *Ostertagia asymmetrica* was found in the abomasum of all the deer (eight) examined.

A List of Parasites Examined During the Year. By J. S. STEWARD. *Second Report of the Director of Institute of Animal Pathology, Cambridge*, 1931.

THE list covers three pages of the Report, and contains records of the parasite, host, site in the host, locality from which obtained, and occasional remarks. Amongst the more interesting records are: *Œsophagostomum dentatum*, occurring in the cæcum and colon of pigs, and being probably responsible for their deaths; an Argasid tick (*Argas vespertilionis*), from the common bat in Wales; *Dermanyssus avium*, as being the cause of deaths in chickens a few days old, the mites being present in thousands in the litter; Coccidia (*Isospora sp.*), in the dog and cat. There are also included records of parasites from freshwater and marine fish.

Reviews

Recent Advances in Pathology. By GEOFFREY HADFIELD, M.D., F.R.C.P. Lond., *Professor of Pathology in the University of London; Pathologist to the Royal Free Hospital;* and LAWRENCE P. GARROD, M.A., M.B., B.Ch. Camb., M.R.C.P. Lond., *Bacteriologist and Lecturer in Bacteriology, late Demonstrator of Pathology, St. Bartholomew's Hospital.* London: J. & A. Churchill. 1932. Pp. x + 392, figs. 67. Price 15*s*.

THE publishers have performed a notable service to medical and veterinary pathologists in persuading Professor Hadfield and Dr. Garrod to add to the highly-valued "Recent Advances" Series an admirably written survey of the progress in pathology. With immense industry, knowledge, and critical ability, the authors have not only achieved the objects so modestly expressed in their preface, but they have earned for themselves a place in the leading rank of scientific medical authorship. The advance in knowledge of each subject, and the biological principles upon which it is built, are analysed and concisely presented; an attractive narrative form is preserved throughout the book. In the first chapter the composition and functions of the tissues comprising the reticulo-endothelial system are defined; evidence is found to support Maximow's theory of the macrophage (histiocyte, clasmatocyte) being derived from the lymphocyte. A chapter on tissue culture is followed by an unrivalled review of the progress in cancer research, including carcinogenesis, transplantation of tumours, filtrable tumours, tumour metabolism, the hereditary factor in cancer, and the actions of therapeutic agents. After a review of the vitamins, hypervitaminosis and calcium metabolism, each of the remaining eight chapters is devoted to disease classified by the method of special pathology. In the chapters on the cardio-vascular system, the conclusion that infective endocarditis in man is the result of infection of the heart valve from without, and not from within, cannot be accepted as the pathogenesis of all such naturally occurring lesions in the domesticated animals. The reference to Conradi's bacteriological investigation of the tissues of newly slaughtered cattle and swine as indicating bacteræmia in normal health is unfortunate, as rapid contamination of the tissues, including joints and bone-marrow, is the invariable consequence of ordinary methods of slaughter of food animals. The account of the pathogenesis of lobar pneumonia in man contains conclusions which invite the reflection that study of the natural lesion in domesticated animals may be necessary before the disease in man is fully understood. The common occurrence of lobar pneumonia in animals as a consequence of a specific septicæmia cannot be correlated with the conclusion

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that " infection reaches the lung by the air passages," which is based on the fact that the lesion has not resulted from the injection of pneumococcus into monkeys and other animals. Hepatic necrosis, of particular interest to the veterinary pathologist, is not discussed with that facility and knowledge manifest in the descriptions of other lesions of the digestive system.

The changes in the kidney associated with essential hypertension are discussed with advantage under diseases of the arteries, but there appears to be no mention of those due to acute and sub-acute bacterial infection, a problem of greater account in veterinary pathology. A detailed study of the functional derangement, morbid anatomy, and histology of Bright's disease occupies two chapters. In many respects the author's treatment of the subject is preferred to that of Miss Dorothy Russell's, but it may take a long time before veterinary pathologists are able to correlate their classification of renal disease in animals (under inflammation, degeneration, and ischæmia) with these new concepts of human pathology. A section on the neuroglia and the glioma group of tumours is followed by a summary of encephalitis due to filtrable viruses, which is of great value to the comparative student. In the final chapter, on the thyroid, parathyroid and adrenal glands, reference to recent advances on the pituitary gland has been omitted.

The photomicrographs, particularly those illustrating renal lesions, and those on scurvy, from the work of J. R. M. Innes, M.R.C.V.S., are excellent. At the end of each section the authors have given references to the original and more important literature upon the subject. The indices of the subjects and authors also give satisfaction. Possibly experienced workers in human pathology may find omissions or errors of detail here and there, but our sole criticism of the book is that in the discussions on the pathogenesis of disease (*e.g.*, endocarditis, lobar pneumonia, hepatic necrosis, contracted kidney) the observations of veterinary pathology have been ignored. An adequate interpretation of disease processes must take account of naturally occurring disease in animals in addition to that of man. Whether the authors for their second edition may be disposed to enlist the assistance of veterinary pathology or not, this first edition by Professor Hadfield and Dr. Garrod is recommended as a necessary guide and inspiration to progress in the pathology of domesticated animals.

TOM HARE.

The Extra Pharmacopœia. By MARTINDALE AND WESTCOTT. 20th ed. In two volumes. Revised by W. H. Martindale. 1932. London: H. K. Lewis & Co., Ltd.

THE latest edition of Martindale's Extra Pharmacopœia is now to hand. The previous practice of dividing it into two volumes has been continued. This work is so well known that it needs no introduction here. It should be stated, however, that it is a veritable mine of valuable information, and whilst it is prepared essentially for the use of the physician and the pharmacist, no veterinary practitioner should be without it. Volume I is devoted mainly to the materia medica and to treatment with drugs and chemicals. Short pharmacological extracts complete with references appear with each drug. The various Acts of Parliament dealing with poisons and dangerous drugs are included in this volume, and are clearly explained.

Volume II is devoted mainly to matters of diagnosis, analysis and assay, and subjects too numerous to mention in the first volume. Amongst them one finds: tests and microscopic methods for examining urine, blood, fæces, etc; water and milk analysis. Such subjects as iontophoresis, radiology, ultra-violet rays, radium therapy, are discussed, and the more significant findings are abstracted and summarised. The more important therapeutic substances which are marketed under trade names are included.

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Die Tiere im chemischen Kriege. By Prof. C. E. RICHTER, D.V.M. Berlin: Richard Schoetz, 1932. Pp. 141, with 40 illustrations and 4 coloured plates. Price, bound, M. 11.40.

THIS book deals with injuiries caused to animals in the War by chemical compounds, and the measures to be used in the field and at home against these substances. There is a short résumé of the arrival and development of chemical warfare, and the susceptibility of animals to various chemical attacks, and the effects produced by these substances are described. The special pathology and therapy of the subject as it applies to single instances is discussed. Further chapters deal with the effects produced by artificial gases, and the protective measures to be adopted against them. These protective measures clearly come under the province of the veterinary surgeon, and the author considers that students and practitioners should have a good knowledge of the subject. The illustrations and coloured plates in the book add considerably to the value of the text.

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The Dimol Laboratories, Ltd., of 40, Ludgate Hill, E.C.4, have informed us that in future the Dimol veterinary preparations will be known and sold under the registered Trade Mark "Dianimol," and will be supplied by Dimol (Veterinary) Ltd. All the preparations will still contain the well-known non-toxic intestinal antiseptic distinguished by the Trade Mark "Dimol," supplied direct to Dimol (Veterinary), Ltd., by Dimol Laboratories, Ltd.

CHLORODYNE.

We are advised that the manufacturers of the 100-year-old remedy, Dr. J. Collis Browne's Chlorodyne, have again reprinted their folder "A Medicine Chest in a Vest Pocket." This preparation is well known to our readers, as its name has appeared (usually on the back page) in this Journal for over fifty years.

Dr. J. Collis Browne's Chlorodyne was accepted by the Army Council, and used for the forces in the Great War as successfully as it was in the Crimean and South African Wars.

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